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(CHICAGO)

Index to Volume XVIII, 1912

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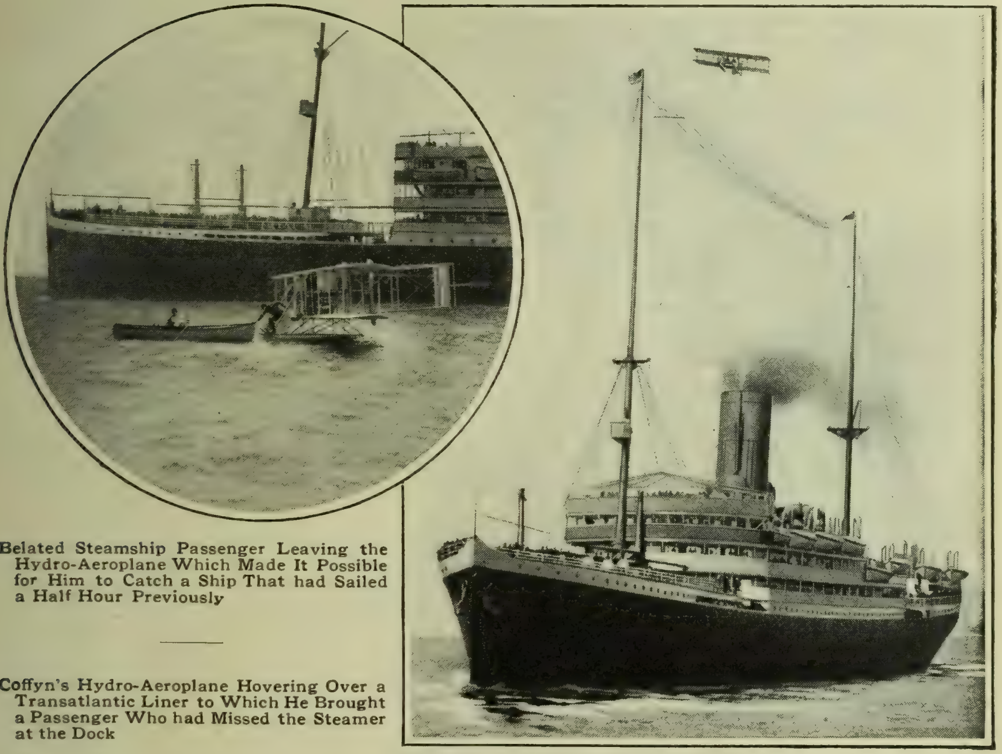
Vol. 18 JULY, 1912 No. 1

Passenger Uses Aeroplane to Overtake Liner



Belated Steamship Passenger Leaving the Hydro-Aeroplane Which Made It Possible for Him to Catch a Ship That had Sailed a Half Hour Previously

Coffyn's Hydro-Aeroplane Hovering Over a Transatlantic Liner to Which He Brought a Passenger Who had Missed the Steamer at the Dock

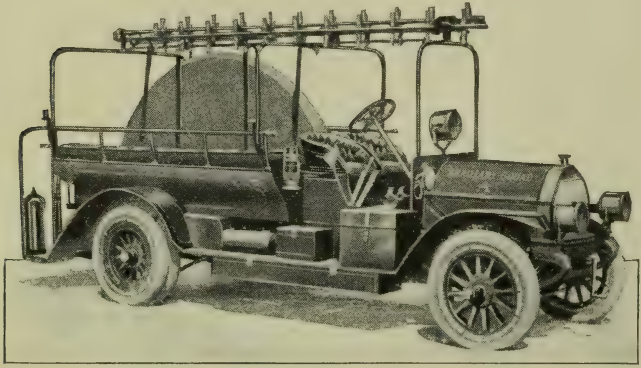
Photos Copyright by International News Service

AEROPLANES have not yet been listed as part of the dock equipment of the big steamship companies—to be used to catch departing vessels by belated passengers—but there may come a time when such a means of transportation will be provided. At any rate the idea is not a wild imaginary scheme, as it has been actually tried. A belated passenger in New York recently chased and overtook a steamer sailing for Europe and was put aboard, the aeroplane being the vehicle with which he accomplished his purpose.

The thing was done only a short time ago. The passenger was not really belated, as he could have reached the steamer in time for the sailing if he had not made arrangements to remain a little longer ashore. Thirty minutes after the boat left its dock the passenger and Frank Coffyn, the airman, set out in pursuit in the latter's hydro-aeroplane. The flying machine caught the steamship in a very few minutes after making a record trip down New York Harbor about 500 ft. from the surface. After circling the ship twice the hydro-areoplane dropped to the water and a boat was put off from the steamer for the passenger. When the passenger had been taken from his machine Coffyn rose in the air again and returned to his starting point. This is the first time this feat has ever been accomplished, although once before an aeroplane was sent in pursuit of a steamship to deliver a package to a passenger aboard.

LIFE-SAVING MOTOR FIRE TRUCK

The latest acquisition of the Springfield, Mass., fire department, which is a pioneer in the use of motor fire apparatus, is a life-saving motor truck. In the center of the body, between the long side seats, is a life net, folded in so compact a form that it does not interfere with the carrying capacity of the machine. Three scaling ladders are carried on metal-rod supports above the life net. The other devices included in the equipment are a smoke helmet, an oxygen respirator for use in cases of partial suffocation, and a medical outfit.



The Special Life-Saving Motor Truck of the Springfield, Mass., Fire Department

NEW NON-CORROSIVE ALLOY

A patent has recently been given to the representative of a metal company in Philadelphia on a new white, non-corrosive, and malleable alloy of iron, nickel and copper. It is said that this alloy may be rolled into sheet, rods or bars, or drawn into wire, and may also be cast in sand.

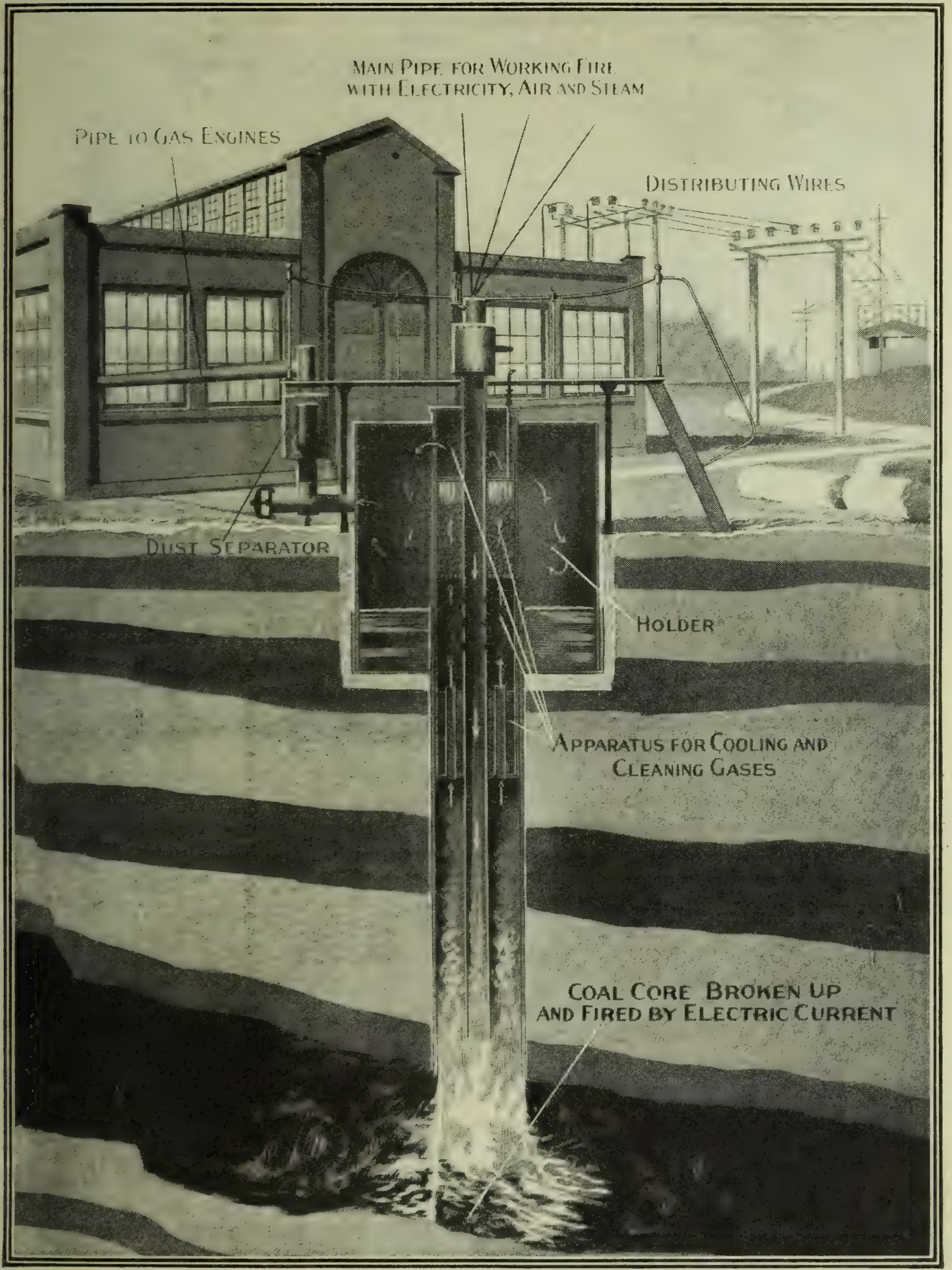
ELECTRIC LIGHT WITHOUT HEAT

A flame that will not give off heat is claimed to have been derived by a French inventor, M. Dussaud, from electric energy. No details are given regarding this invention, however. M. Dussaud declares he has succeeded in communicating to a point of metal placed in a vacuum an electric intensity which he could not obtain with the filament of ordinary burners. This cold light can be placed without danger in close proximity to reflectors, condensers or diffusers, so that an apartment can be illuminated by an electric battery or box of accumulators, the electricity used being 200 times less than with the ordinary light.

A tiny point of cold light, given by an electric battery of only 30 watts, sufficed to replace a moving-picture lantern, and celluloid films can thus be used without danger. Owing to the smallness of the battery necessary, there is a great future for the "cold light" for stage purposes, a boy or girl being able to carry this tiny battery anywhere. It will also prove useful for medical purposes, claims the inventor, for when the lamp is placed in the hand, the blue veins are shown distinctly against the rose-colored background. Thus it will be possible to illuminate the lungs by the use of this invention.

¶The word lens comes from the Latin word for lentil seeds which have a double convex shape like a lens.

SCHEME FOR CONVERTING UNMINED COAL INTO GAS


Main Pipe for Working Fire with Electricity, Air and Steam
Pipe to Gas Engines
Distributing Wires
Dust Separator
Holder
Apparatus for Cooling and Cleaning Gases
Coal Core Broken Up and Fired by Electric Current

Sir William Ramsay, one of England's famous scientists, says there is absolutely nothing, so far as he can see, to prevent a bore-hole from being put down until the coal stratum is reached and the setting of the coal on fire by electricity, thus converting the coal in the bowels of the earth directly into gas. Air would be sent down to enable the coal to burn, the amount of air being restricted when sufficient heat had been engendered; steam would be sent down to provide a mixture of hydrogen and carbonic oxide, or water-gas; great gas engines would be mounted at the mouth of the pit or bore-hole, and the gas would be used to develop electric power for distribution throughout England.

PLAYING GOLF IN ARMOR

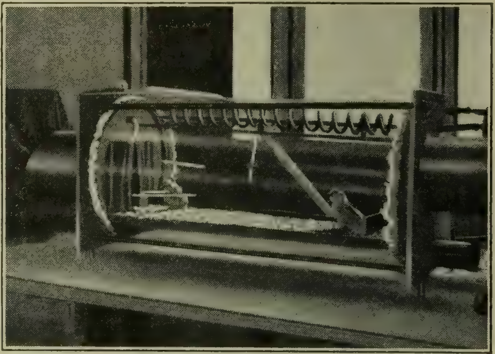
In the accompanying illustration is shown a well-known English baritone, who has been appearing in a London production as St. George, the patron saint of England, practicing golf strokes in his full stage suit of iron armor. On St. George's Day he played a nine-hole match on the Bushey Hall golf links, this being the first time that the Dragon-slayer ever entered the list—or rather the links—of golf.

TESTS PROVE BACILLI NOT NECESSARY TO LIFE

In interesting experiments at the Pasteur Institute, Dr. Cohendy has shown that bacilli are not necessary to the life of vertebrates (the division of the animal kingdom comprising animals having a backbone of bony or cartilaginous vertebræ). By using chickens for his experiments he demonstrated that it is possible for vertebrates, normally rich in bacilli, to live without these organisms.

In these experiments he sterilized the eggs the day before the chickens were due, placed them in a bronze incubator, and put this in a hermetically sealed casing, thoroughly sterilized. After the chicks were hatched out they were able to walk about inside the glass part of the apparatus, under conditions as nearly normal as possible, but with the sand, the air, the fresh water, and the food all rendered free from bacilli. The chicks were kept sterilized for six weeks and grew as vigorously as others living under the customary conditions. They were then removed and permitted to live the usual existence, and in less than 24 hours their organs were invaded by innumerable bacilli, and no ill results were suffered.

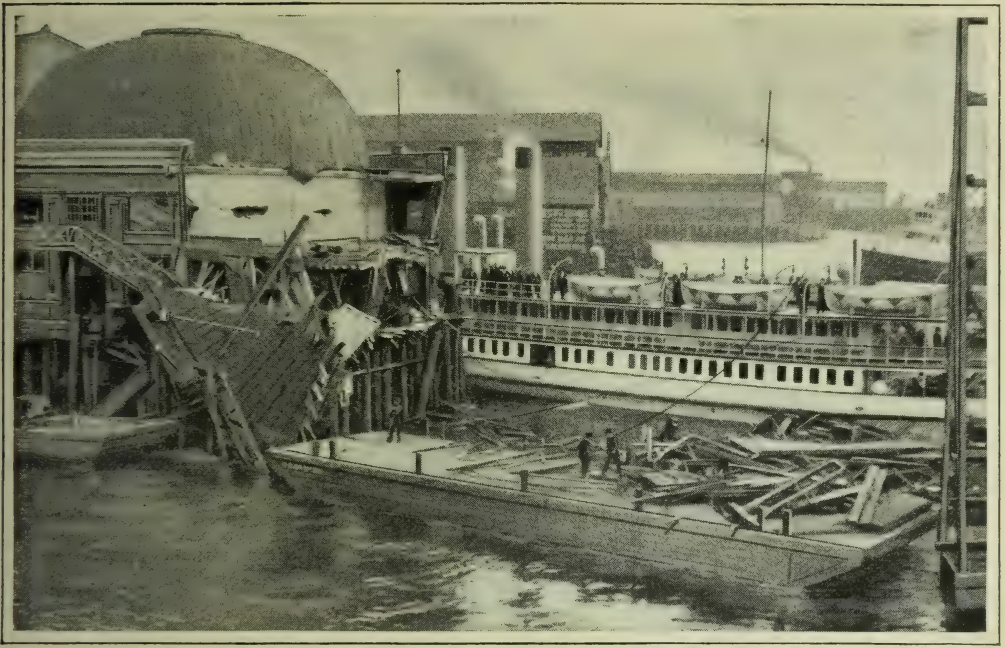
Dr. Cohendy, of the Pasteur Institute, Sterilizing Eggs a Day before the Chicks were Due



The Chicks in the Bacilli-Free Apparatus in Which They Thrived for Six Weeks

ANTICS OF PET ANTS AMUSE PARIS

The latest fashionable pastime in Paris is watching ants work. The insects are placed in a small quantity of earth, under a glass cover, and it is quite interesting to see them install their new home. After a time a few strange ants are introduced into the colony, and then the original dwellers mobilize to receive the invaders, closing up their subterranean passage to prevent attack, while warfare is carried on by a chosen army. This fad has become quite popular, since first brought to the notice of society by a Parisian actress, and the new game is hailed with delight.

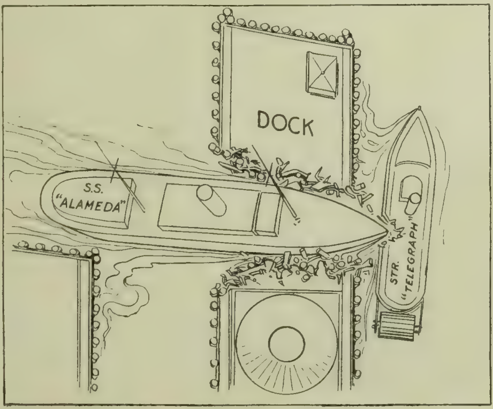


Wreck of Seattle Dock after It had been Demolished by Steamer. Pile Driver at Right Marks End of Pier before Accident

BIG SHIP CUTS THROUGH DOCK AND SINKS VESSEL

A striking illustration of the force of a steamship under way is afforded by a recent accident at Seattle, Wash., in which the steel steamship "Alameda," a vessel of 3,158 gross tons, through misinterpretation of engine-room signals, cut clean through a dock 60 ft. wide, amputating the outer end as neatly as a knife cuts cheese. Passing on through the dock the steel steamship cut an 8-ft. gash half way through the wooden stern-wheel steamboat "Telegraph," sinking her immediately.

The surprising part of the accident, from the mechanical view point, is that the steamship had barely got under headway. The "Alameda" was light and was being warped into a slipway. The captain rang for half speed astern, and an assistant engineer threw the gear into full speed ahead. With about half her length in which to get under way, the steamship bore down upon the next dock, and despite the dropping of the starboard anchor, plowed clean through and deep into the wooden steamboat on the other side of the dock, carrying it across the slipway before headway was checked.



Sketch of the Pier When Accident Occurred, Showing How the "Telegraph" was Rammed by the "Alameda"

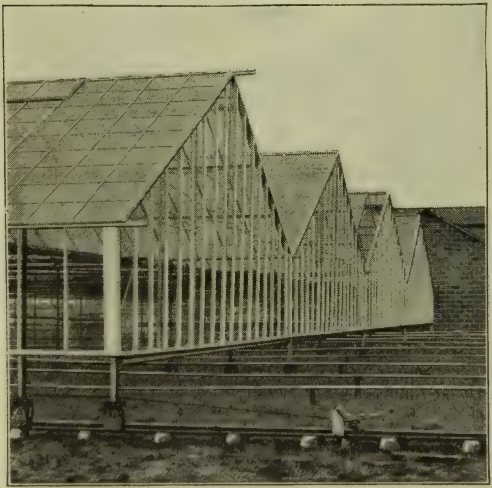
It appeared that the engines were not at full speed ahead for more than a couple of minutes before the error was rectified, and the signal "full astern" answered. The "Alameda" backed out of the wreck almost uninjured, with a big wooden clock tower which had stood on the dock draped over her bows.

When one considers how difficult it was to check the headway of this steamship, 314 ft. long, it gives a clearer idea of the difficulty of stopping a steamship the size of the wrecked "Titanic," if it were going at full speed, in time to prevent it hitting an iceberg sighted a quarter of a mile ahead.

A Complete View of the Wheeled Greenhouse, Which Covers an Area of Almost 25,000 Square Feet

A GREENHOUSE ON WHEELS

Ordinarily, carnation plants raised in the open during the summer months must be transplanted in a greenhouse for winter production, but one grower has developed a plan of transplanting his greenhouse instead of the plants. Five light tracks, placed on concrete foundations, were laid lengthwise of the carnation beds, and a greenhouse 174 ft. long by 35 ft. wide, consisting of four bays and covering a total ground space of 24,360 sq. ft., was built on wheels. Plants are set out in the carnation beds in the spring and the traveling greenhouse is moved into position over them in the fall, thus allowing the growing process to continue without interruption.

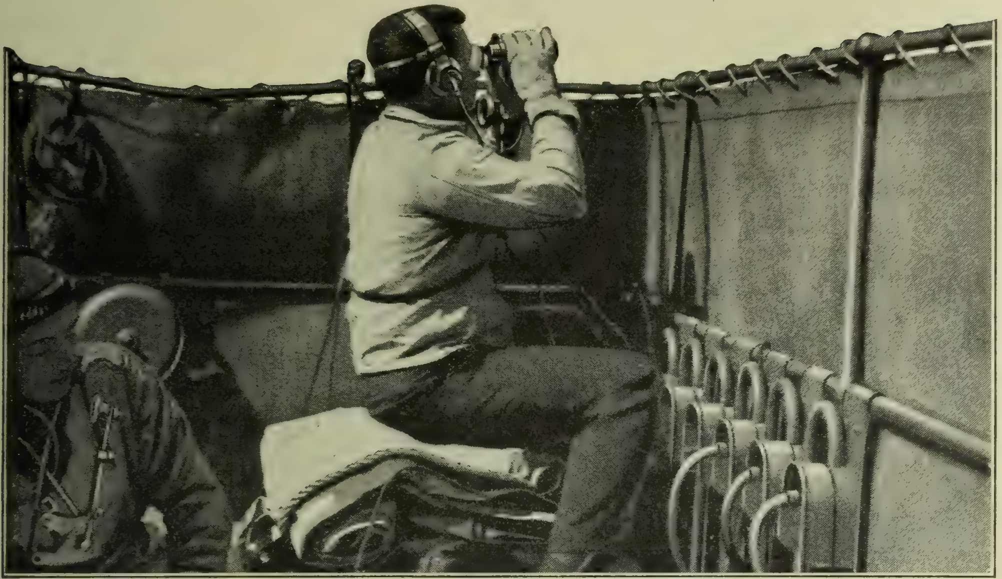


One End of the Traveling Greenhouse, Showing the Method of Drawing It over the Carnation Beds in the Fall of the Year

Each bay of the wheeled greenhouse is supported by pipe posts, and the roof framework is securely trussed by means of steel T-iron and rods. All the heating pipes are carried overhead, and arrangements are made at each end for connection with the pipe lines leading from the heating plant.

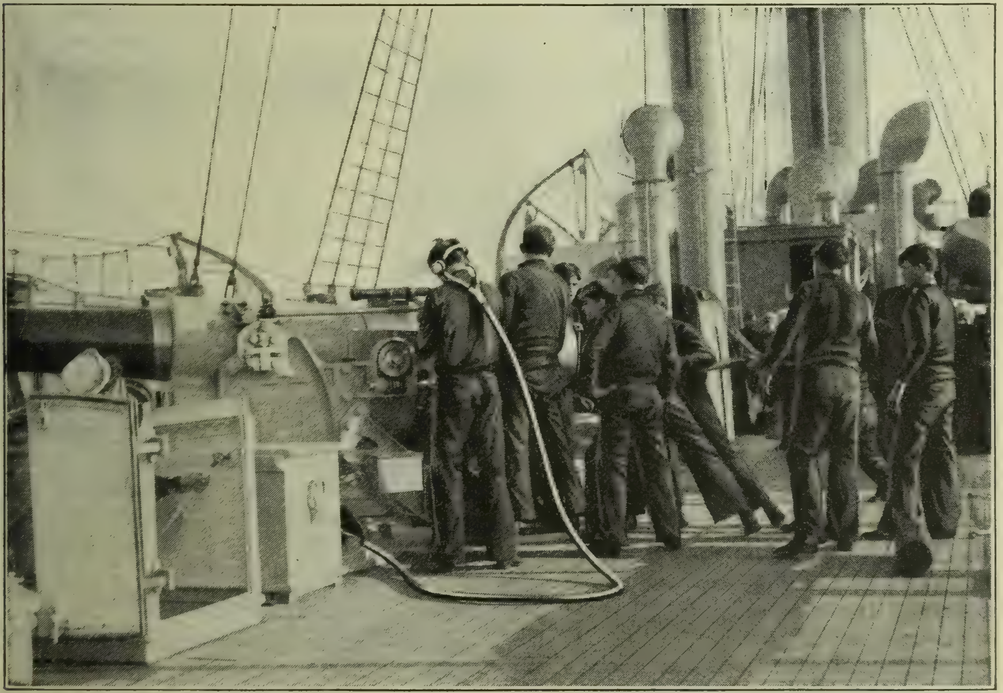
HOW NAVY GUNNERS USE THE TELEPHONE

The ordinary layman who cannot hear what is being said over the telephone, if a heavy truck or a trolley car happens to be passing when he is trying to carry on a conversation over the wire, looks rather incredulous when he is told that orders to gunners in the navy and army are transmitted by telephone from the observation platform at the top of one of the ship's skeleton masts or the observer's tower in a fortification. How can the gunner hear what the spotter has to say in the terrible din of battle practice, he naturally asks. That is simple enough when explained. The telephones used are very different from those put in houses, in that they



The Observation Platform at the Top of the Skeleton Mast of a Modern Battleship, Showing the Telephone Receivers and Transmitter on the Man Who Sights the Target, by Means of Which He Gives the Exact Position to be Fired Upon

have diaphragms constructed to magnify sound and the receivers are held close to the ears of the man taking the sight from the observer. The latter is equipped with a specially constructed transmitter which is so hung over his shoulders that the mouthpiece is close to his lips at all times.



Photos Copyright by Enrique Muller

A Deck Gun Station on a Modern Battleship, Showing Gunner Receiving Information as to the Target from the Observer on the Skeleton Mast, the Long Cable Trailing behind Him Conveying the Telephone Wires

Receivers, which are bound with flexible rubber, are clamped tightly to the ears of both the gunner and the observer and the wires running from the former's headpiece are incased in heavily armored cables of such length that the gunner can move about, dragging the cable after him.

TALKING MONKEYS AND TEACHER

Dr. William Furness, who is acknowledged to be a trained psychologist, skilled in modern critical technique, has, after two years of work in the experimental department of the University of Pennsylvania, succeeded in teaching two big African chimpanzees to converse with a limited number of words over and above their native and phylogenetic (racial) sounds. In other words the instinctive calls of the hordes and families, tribes and individuals, have been definitely and positively excluded, and these two chimpanzees have been successfully educated to the point where they exhibit all of the earmarks of imagery, memory, and elemental conceptions.

Dr. Furness with His Two Talking Monkeys

Further than this, Dr. Furness has imported two other Borneo monkeys of the same species, which he intends to breed to the educated monkeys, and to teach the offspring, thus seeking to discover the relative facilities of the younger and older ones in acquiring a vocabulary independent of instinctive noises and jargons.

In his work Dr. Furness has used many of the newer psychological methods, many of them discovered by Dr. John Watson of Johns Hopkins University, of definitely associating a given image or object with a corresponding simple sound, different from, yet as simple as the native instinctive calls and speeches of the monkey family. Although the two chimpanzees have no large vocabulary, they have so far been successfully taught about 20 indubitable sounds that are objectively and exclusively associated with certain things.

Thus "gob" means food, "eech" means water, "rrb" means jump or run or walk, "rrgrrr" means mirror, "sssrrr" means box, and so on. Dr. Furness was careful to approach as close to the instinctive racial calls as possible, though never quite doing so. It is possible, according to Leonard Hirschberg, of Johns Hopkins University, for even a child to note the differences in quality, pitch and timbre of the two sounds, speech and instinct calls.

Dr. Furness, like other psychologists, says that no one can ever take the so-called monkey language of Professor Garner and others who live with the animals and interpret merely the animal means of notifying each other of fear, love, danger, food, drink, etc., as serious or scientific attempts at developing animal speech. The method must be the human pedagogical one. The animal must show curiosity toward an object, and then must always be given a strictly and exclusively associational vocal noise upon seeing or wanting the same object.

ℭThe United States and its dependencies produce one-tenth of the total amount of sugar manufactured in the entire world.

Practical Proofs of Streamline Theory

By VICTOR LOUGHEED

Such widespread attention was attracted among students of aviation science, by the articles in the December and January numbers of Popular Mechanics Magazine, in which there were made public for the first time the facts concerning certain phenomena of the streamline form in aeroplane designing, that it affords us much pleasure to publish herewith the visible evidence of the soundness of Mr. Lougheed's conclusions which is furnished in the accompanying photographs secured at French aviation fields. It will be remembered that the most important new discovery in the Lougheed researches was the "definite propelling effect exerted on the rear portion of a streamline form" by the compressed masses of air adjacent to the form. This effect, aptly termed by its discoverer the "reaction impulse," involves one of the fundamental principles in flight engineering, and accordingly is to be commended to the most critical consideration of all who are interested in the subject.—THE EDITOR.

TO have a merely technical and theoretical appreciation of a proved fact in engineering is one thing, and to possess the same conception in a definitely practical and visualized form, so that all of its significances are clearly apparent, is something distinctly different.

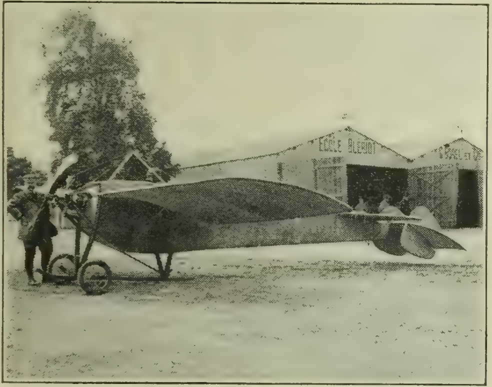


Fig. 1—Nieuport 20-hp. monoplane on the ground, showing tautness of the body fabric when the machine is at rest, thus proving, by contrast with the same machine in the air, the reality of the "reaction impulse."

To realize, for example, that objects of different forms and sections differ in the resistance they oppose to movement in the air is a simple, readily-understandable, and probably not even a very interesting proposition. But really to see in an illustration or, better

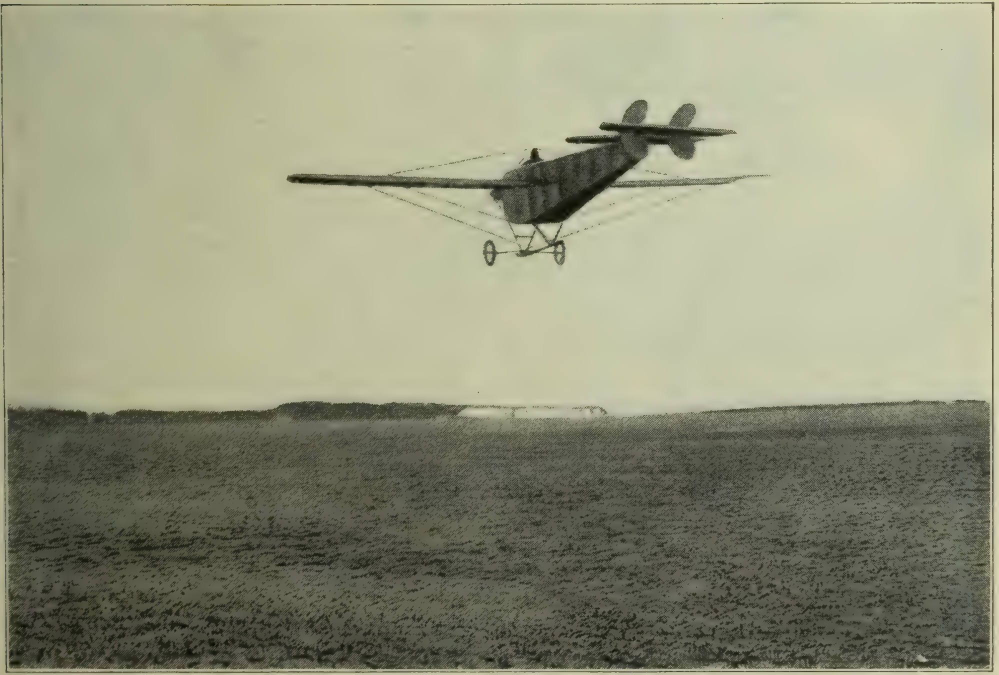


Fig. 2—The "reaction impulse" made visible on a Nieuport 20-hp. monoplane in the air, with the body fabric deeply sagged under the pressure that is the heretofore undiscovered secret of the efficiency of the streamline form.

still, in an actually operative machine, the absolute quantitative effect of these qualitative differences is to possess a type of knowledge that reaches the average mind with an explanatory force, wholly lacking in text dissertations or tabular presentations of the same facts.

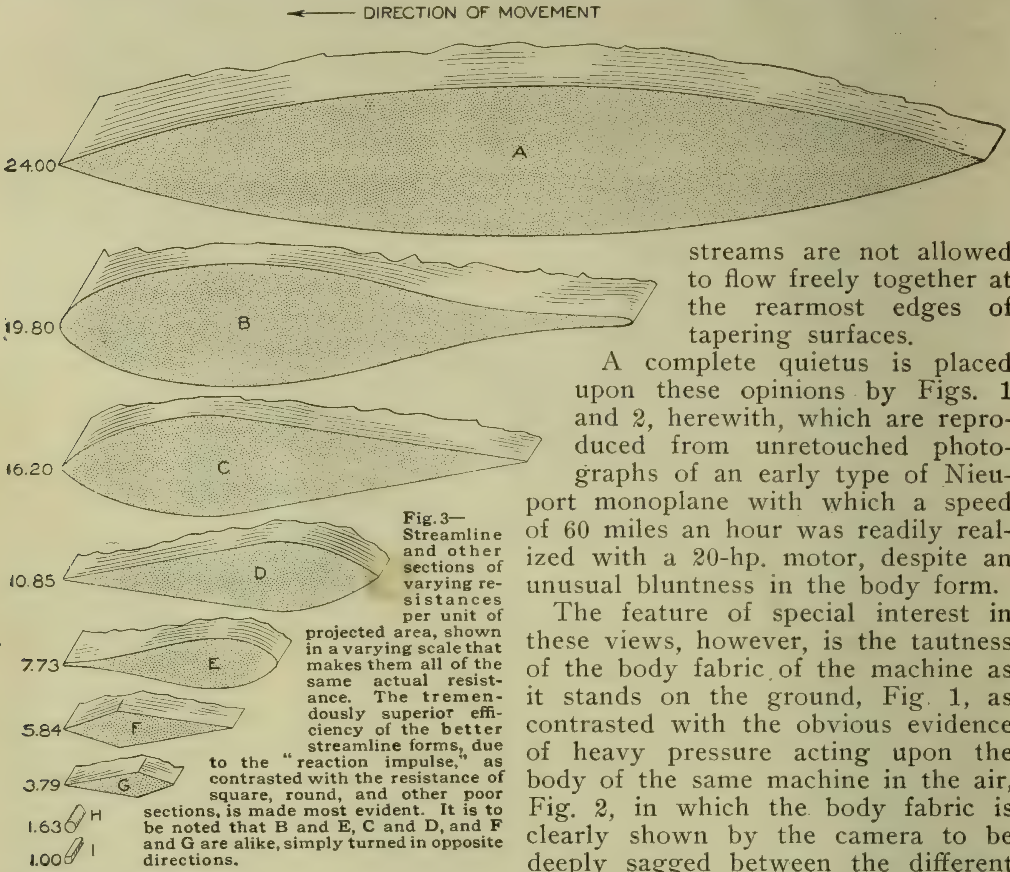


Fig. 3—Streamline and other sections of varying resistances per unit of projected area, shown in a varying scale that makes them all of the same actual resistance. The tremendously superior efficiency of the better streamline forms, due to the "reaction impulse," as contrasted with the resistance of square, round, and other poor sections, is made most evident. It is to be noted that B and E, C and D, and F and G are alike, simply turned in opposite directions.

The writer recently published a claim to have discovered that the remarkable efficiency of streamline forms and sections is due to a propelling pressure, exerted on the tapered rear portions of these bodies by adjacent masses of air that are, for the moment—as a result of their initial separation by the front portion of the object—in a condition of dynamic and rapidly dissipating, but nevertheless very real and measurable pressure. In contradiction of this claim it has been asserted that the greater retarding effect of the atmosphere upon the poorer forms that have been experimented with for aeroplane elements is due to a retarding suction, supposed to manifest itself, if the air streams are not allowed to flow freely together at the rearmost edges of tapering surfaces.

A complete quietus is placed upon these opinions by Figs. 1 and 2, herewith, which are reproduced from unretouched photographs of an early type of Nieuport monoplane with which a speed of 60 miles an hour was readily realized with a 20-hp. motor, despite an unusual bluntness in the body form.

The feature of special interest in these views, however, is the tautness of the body fabric of the machine as it stands on the ground, Fig. 1, as contrasted with the obvious evidence of heavy pressure acting upon the body of the same machine in the air, Fig. 2, in which the body fabric is clearly shown by the camera to be deeply sagged between the different elements of the wooden framing beneath it. Since the fabric is very stout, and is tightly stretched in applying, as is evident in the flat and uniform appearance presented when the machine is on the ground, it is certain that the dished-in appearance in the air can be due to nothing else than the dynamic pressure previously referred to, thus visibly acting on the wedge-like rear of the body.

Concerning the question of suction, as constituting a retarding influence upon the movement of any object through the air, it seems incredible that, in view of the trivial inertia and extreme mobility of masses of air, it is in any way possible to create a measurable vacuum in a free atmosphere.

Consider, for example, the condition of a piston being drawn out of a closed cylinder. In this case there is, of course, a high vacuum established, with a corresponding resistance to the movement of the piston.

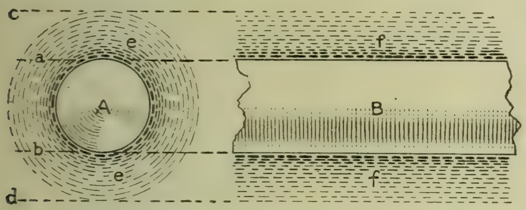


Fig. 4—Comparison of streamline form with streamline section, both approaching the observer. Though the diameter *a b*, and the displacement of air *c d*, are of the same linear extent in both cases, the difference in the geometrical conditions involved compels the air at *f f*, in the case of B, to be compressed into one-half of the space it originally occupied, as against the compression into three-fourths of the original space at *e e*, in the case of A.

But if in place of the usual rigid cylinder there should be substituted some soft, flexible tube—like the thin inner tube of a very light bicycle tire, say—then, is it conceivable that any possible rapidity of piston movement could prevent the tube from caving in under the exterior atmospheric pressure behind the piston? To carry the reasoning further—when there is not even so frail and flexible a tube as that just premised, how can it be in any way possible to produce a measurable retarding vacuum behind a moving object in the free atmosphere?

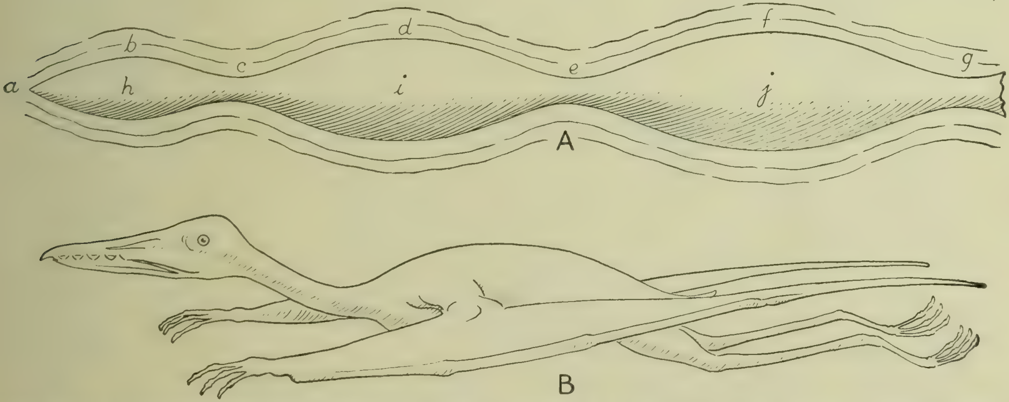


Fig. 6—At A is shown a plurality of streamline bodies, providing a succession of compressions, reactions, recompressions, etc. At B is pictured a reconstruction of the extinct pterodactyl, in which, as in many birds, the head and body constitute the first two elements of such a system of tandem streamline bodies as that sketched at A.

In fact, it can be stated with absolute assurance that the most that can occur is for the moving object to drag with it a greater or smaller mass of air, too small in volume and too light in weight, in even the most extreme case, to add appreciably to the load.

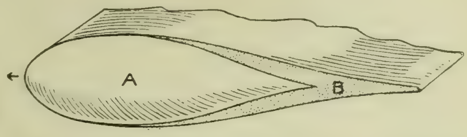


Fig. 5—Side view of streamline body **A** compared with streamline section B, showing the shortening of the former to secure equivalent effects.

Another point that is against the vacuum theory is the fact that the normal sea-level atmospheric pressure is materially over a ton to the square foot, so if the vacuum condition prevailed at all, it should be reasonably expected that the resistance due to it would be vastly higher than any that are now discoverable, for even with the most ill-designed machines that have been flown—at speeds as high as 100 miles an hour—the resisting pressure to the square foot of projected area in no case is as high as 30 lb. to the square foot—only 1/70 of atmospheric pressure.

Figure 3 is another startling example of what the "reaction impulse" really means to flight efficiency. This diagram is based directly upon researches made by Sir Hiram S. Maxim in conjunction with his aeroplane experiments in England in 1893, and by him published—with a seemingly unaccountable failure to emphasize their full importance—on pages 53-55 of his book "Artificial and Natural Flight." Accordingly, the numerals appended to the different sections, from A to I inclusive, show the relative resistances of these different forms, without any change from Maxim's data, but the essential difference between this diagram and ones previously published consists in the reproduction of the different sections on a relative scale that is in inverse proportion to the relative resistances—so that the various sections, with the sizes as shown, have all the same resistance. So in this presentation there is made most plain the tremendous importance of designing every part of an aeroplane, even including the struts and stay wires, in the most perfect streamline sections possible.

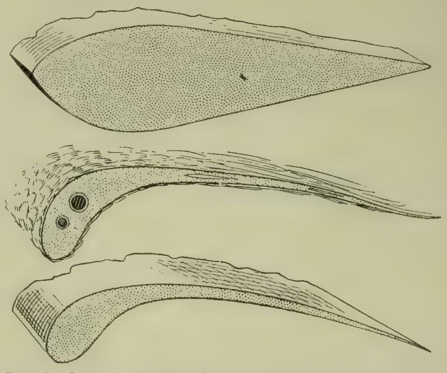


Fig. 7—Unsymmetrical streamline body and wing sections, the first being the body of a Nieuport monoplane, the second the section of a pelican's wing, and the third an aeroplane supporting surface.

In Fig. 4 is shown an interesting and heretofore neglected distinction that it is necessary to make between streamline *sections* and streamline *forms*. In this diagram, A is a front view of a streamline body, or form, coming towards the observer, while B is an edge-on view of a strut of streamline section, similarly moving toward the observer. Now, assuming that the dimension *ab*—the diameter of the streamline form in the case of A and the maximum thickness of the strut in the case of B—is one inch and that the zone of air thrown into measurable compression by the passage of the two objects extends from *c* to *d*, a distance of two inches, then a most interesting condition results. This is because in the case of A the air is displaced by the form radially, in all directions, into the annular space *ee*, which—because of the geometrical law that the areas of circles increase with the squares of their dimensions—is a space three times as great as that occupied by the form. In the case of B, however, the air is not displaced radially by the strut, but, because of this being of an indefinite length, is moved directly up and down into the space *ff*, of an area and consequent volume only as large as that occupied by the form.

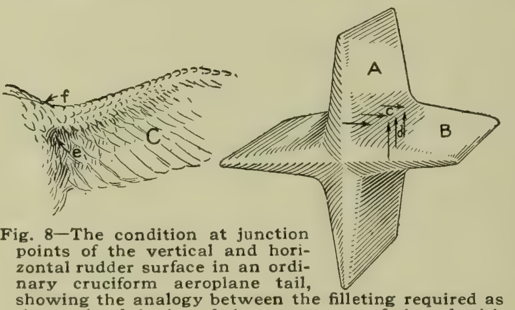


Fig. 8—The condition at junction points of the vertical and horizontal rudder surface in an ordinary cruciform aeroplane tail, showing the analogy between the filleting required as the result of the interfering movement of air, *c d*, with the abrupt enlargement at *e f* in a bird's wing.

To sum up, it is now clear that the passage of the streamline form compresses the four volumes originally included in the larger circle at A into a space three-quarters as large as that they originally occupied, while in the case of B the passage of the streamline section compresses four volumes of air into a space only one-half as great as that originally occupied by them.

The inevitable conclusion, then, is that the passage of a streamline strut of a given section must, at a given speed of movement, produce a more positive dynamic pressure than can be realized by the passage of a similar streamline form, because the latter wedges a less amount of air into a larger space. And to secure equivalent compressions and reactions from streamline forms and streamline struts, the forms must be made materially shorter and more abrupt in their curvatures, as is suggested at A and B, Fig. 5, so that the abrupter displacement of the air in the first case will compensate for the lower compression it otherwise tends to produce.

Moreover, to have recourse again to nature for the evidence with which to support a conclusion, it is to be noted that whereas the wings of birds are of considerably elongated streamline sections, of thicknesses ranging from 1/6 to $\frac{1}{10}$ of the chord dimensions, the bodies of birds are relatively much shorter, of major transverse dimensions ranging from ½ to ⅓ of their length.

Another curious bearing of the streamline principle and of the "reaction impulse" it involves is suggested at A, Fig. 6, in which the construction is intended to suggest a plurality of streamline forms ranged one behind another like beads on a string. In such a case there is first the penetration of the air by the point *a*, with the consequent compression to *b*, followed by the "reaction impulse" to *c*,—from which point there would seem reasonably to take place a recompression to *d*, with another reaction to *e*, recompression to *f*, reaction to *g*, etc. Incidentally it is to be noted that, since the "reaction impulse" never can be 100 per cent efficient, there must be a slight loss each time, so that the logical way to compensate for this loss is by the expedient of making the successive forms each somewhat larger than the one preceding.

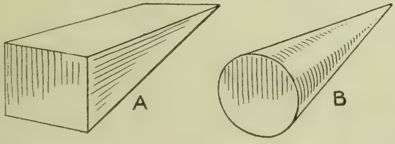


Fig. 9—At A is shown a streamline body tapering like a wedge, while at B is shown a cone-like body tapering to a point

To progress from the theory to its application, it does not require more than the most casual consideration to realize that there are many birds and flying animals in which the head and body constitute the first two elements of such a system of tandem streamline forms. This is particularly evident in the body of the extinct pterodactyl, sketched at B, Fig. 6.

Other examples of adaptation of the streamline principle to special cases are suggested in Fig. 7, in which there is shown first the body of a Nieuport monoplane and below it the sections of a pelican's and of an aeroplane wing. The first of these is an unsymmetrical streamline form, and the others are unsymmetrical streamline sections. The reason for the first would appear to be in some way related to the fact that when an aeroplane is in flight the air adjacent to the top surfaces is in a condition of lower compression than that underneath, which is loaded with the weight of the machine. Consequently it is not likely that a given reaction effect would be secured with the same curves and contours above as below, wherefore the unsymmetrical construction, which in this machine is an adaptation of the bird body form, seems completely justified.

In the case of the wing sections, it is here a necessary condition of operation that the air below the wing should be compressed as intensely as possible, while that above is compressed very little—preferably not at all. In consideration of these points, it will be now realized that a wing section is virtually a streamline section bent into an unsymmetrical curve to produce an unsymmetrical effect.

Figure 8 is a sketch intended to illustrate the conditions that apply in the angles where vertical and horizontal rear-rudder surfaces of the common cruciform types come together. In this, the fact that the air moved by the surface A in the direction *c* must inevitably impinge against that moved by B in the direction *d*, results in an interaction increasing the compression above normal in the corners where the surfaces join together. This presumably can best be allowed for in an aeroplane structure by a modification of the filleting at the junction point, much as is suggested by the similar modification in the wing-section curves at *ef* in the bird wing C.

Another point that aeroplane designers must take into consideration is the fact that a streamline form may terminate in either a wedge as at A or in a point as at B, Fig. 9. While the tapering to a point is probably the ideal, the tapering to a wedge has certain practical advantages, not the least of which is found in the superior security it allows for the means of rudder attachment. And what is lost in the "reaction impulse" sidewise probably is largely regained by the greater area exposed to the "reaction impulse" above and below.

An evidence, accessible to most observers, and which proves not merely the existence, but also suggests the quantitative value of the "reaction impulse," is found in the way in which birds when not in flight are affected by wind. It may plausibly be argued, and has been so argued, that the resistances of the bird to movement in flight are high, and are simply fought against by an amount of energy expended, which is presumed to be very great for the size of the animal. But, in winds so strong that they will compel a man to lean heavily into them to keep from being blown over, it is a fact that small birds on the streets, or larger birds perched on exposed places, while they invariably will take care to hop and move about so as always to face the wind, will rarely be observed to lean into the wind, or to be blown off their feet or out of their position by the impact of even the most violent gusts. The explanation of this phenomenon of the bird form, under a condition that bears no direct relationship to flight conditions, can exist in nothing but the "reaction impulse," of an efficiency so high as to nullify the "head resistance" almost completely.

In conclusion, to refer again to the particular example of the 20-hp. Nieuport monoplane, with its heretofore almost mystifying efficiency, it is calculated that the total projected area of the body is just about 10 sq. ft. Against this, by accepted tables of wind pressures, the resistance at 60 miles an hour is about 170 lb. With an area in the rear portions of the body totaling about 100 sq. ft., at an average slant of about one in eight, a simple arithmetical application of the parallelogram of forces gives a pressure of about 13½ lb. to the square foot, on the rear body surface, as the amount necessary to nullify completely the head resistance.

As a matter of fact there can be no such thing as a 100 per cent efficient nullification of the head resistance, so the actual pressure on the rear body of the small Nieuport must be less than the figure stated—probably no more than 10 lb. to the square foot, which would correspond in this case to a recovery of about 75 per cent of the energy involved in overcoming the head resistance.

A point of especial interest in connection with the subject under discussion is found in the fact that a certain degree of bluntness in a body form—instead of being as detrimental as might be supposed, in comparison with the more spindling shapes that are widely preferred—is of positive aerodynamic advantage. This is because it affords a sufficient abruptness of angle to realize efficiently the reaction impulse, which with a flatter wedge acts less effectively to force out the body from between the opposed pressures, just as it is found with slanted solid surfaces pressing together that there are angles so flat—below the "friction angle"—that lateral movement cannot occur.

In the cases of the best fliers among the birds, instead of an efficiency of only 75 per cent in the reaction impulse, the accuracy of the form, its perfect adjustment to the speed, and the exceedingly small magnitude of the skin friction—of the air flowing over the feathers—all combine to produce an efficiency of probably as high as 99.8 per cent or 99.9 per cent, if recent careful investigations are any criteria.

From all of which it must simply

and conclusively appear that the right road to efficiency in flying must lie, not in the direction of the ill-advised and too-common flimsy structures that by their small edge and projected areas *reduce* head resistance, but, on the contrary, is to be found in the use of thick and substantial sections—like those of the bird wing and bird body—in which there is the altogether more essential provision of a type of form that efficiently *recovers* most of the energy expended in overcoming head resistance.

AERONAUTICAL ENGINEERS WANT A NAME

Some of the men who are attempting to solve the mysteries of the air are much exercised over finding a title by which their particular calling shall be known. There are all sorts of technical names for other kinds of engineers, but none has yet been developed for the man who deals with aeronautics.

There have been numerous discussions of the subject and the choice now appears to lie between "aeronautician" and "aeronician." "Aerotechnician" has also been suggested, and meets with favor when applied to the purely technical man. "Airman" still seems to be more popular for the man who actually runs a machine than "aviator," the first term employed. "Flight engineer" has the merit of being plain English, though it is scarcely as brief as might be desirable.

FISH TINTED TO SUIT BUYER'S FANCY

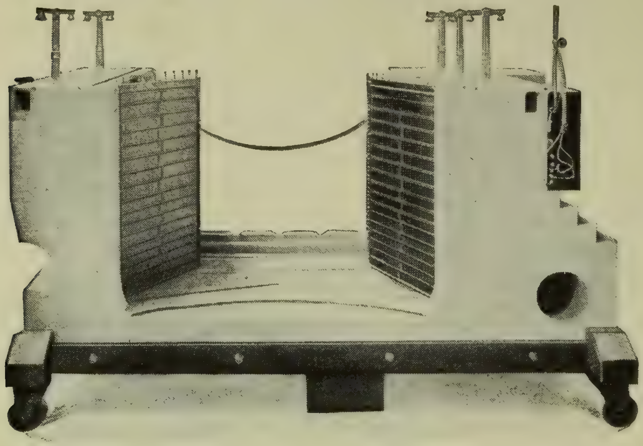
A large trade in goldfish is now being carried on in Sicily, the coloring being obtained by keeping silverfish in water containing certain chemicals, in the form of peat, chalk and iron. After a couple of weeks in this "mixture" the fish are transferred to another bath composed of iron and tan, which has the effect of coloring them red, or black and red, or black, red and silver—according to the length of time they are left in the solutions. These fish fetch a better price than the ordinary silverfish, found in large quantities in that region, but it is remarked that so far they die young.

NON-SPILLABLE FLOWER VASE FOR THE WAIST

An ingenious little flower vase, designed to be worn at the waist, has been invented by a flower-loving Frenchwoman. Its purpose is to provide water for flowers during the time they are worn, and it is so constructed that the water will not spill, even though the wearer should bend as much as 90 deg. from an upright position. The open end of the vase has a construction similar to that of a non-spillable ink well, and the recessed central portion of the vase also aids to prevent any outflow of water.

Holder for Corsage Bouquet That Keeps Flowers Fresh

WORKING MODEL OF PANAMA LOCKS



A Working Model of the Panama Canal Locks Which Shows the Operation of the Big Gates

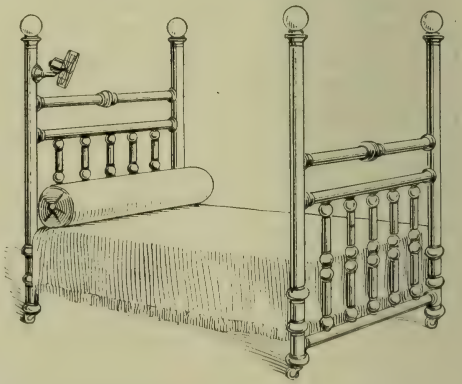
Complete working models of the Panama Canal were recently set up in the Commercial Museum, Philadelphia. The purpose of the model here illustrated is to show the way the big lock gates are worked. This model is on a scale of half an inch to the foot and is complete to the smallest detail. It is worked exactly as the big gates will be worked in the canal locks, which will be opened and closed by electricity. The miniature electrical machinery within the walls of the model can be seen in action.

CANNON DESIGNED FOR USE ON AEROPLANES

A gun that weighs 150 lb. and is so delicately adjusted that it will not show an appreciable vibration though mounted on the most delicate steel springs, has been invented by Commander Cleland Davis of the U. S. Navy for use on aeroplanes. The new gun is 12 ft. long, is made of steel, and fires a 33-lb. projectile that has a muzzle velocity of more than 1,000 ft. per second. This is the largest gun that has ever been made for use on an aeroplane and seems to give to the airman another advantage over his foe on the ground. Heretofore it has been impossible to use a gun in the air, except the ordinary rifle, for the reason that the recoil would be so powerful as to cause the capsizing of the machine, whenever it should be discharged. Commander Davis has devoted considerable time to the development of artillery. In a test that was made the gun was mounted on delicate steel springs and when discharged had no recoil that could be measured by special instruments.

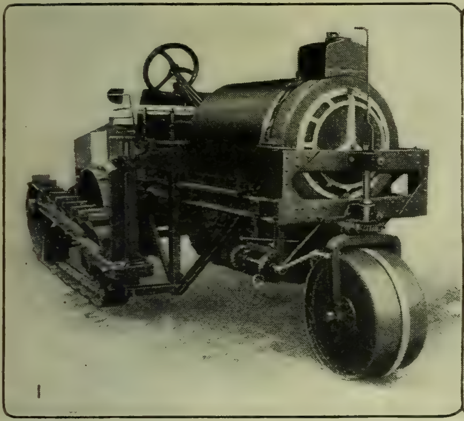
BED EQUIPPED WITH ELECTRICITY

A brass bed, especially equipped with electricity, has been built by a Cleveland manufacturing company. The tops of all four posts carry an electric-light bulb, an electric fan is mounted on one of the posts, an electric heating pad is plugged into a special outlet, and other outlets are arranged for the connecting up of devices such as a water heater and toaster. Switches for control of the devices are arranged on one of the bedposts.



Bed Equipped with Electric Bulbs on Each Post, an Electric Fan, and a Heating Pad

SOME FARM IMPLEMENTS OF FRENCH DESIGN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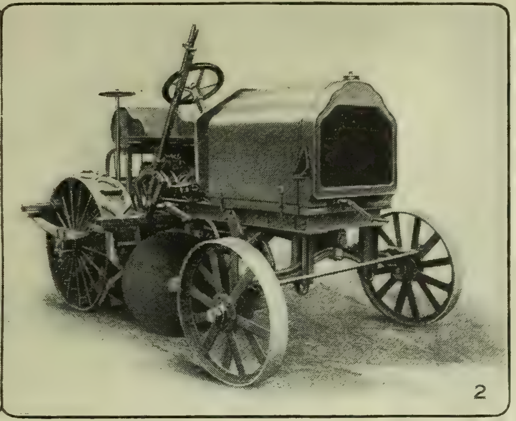
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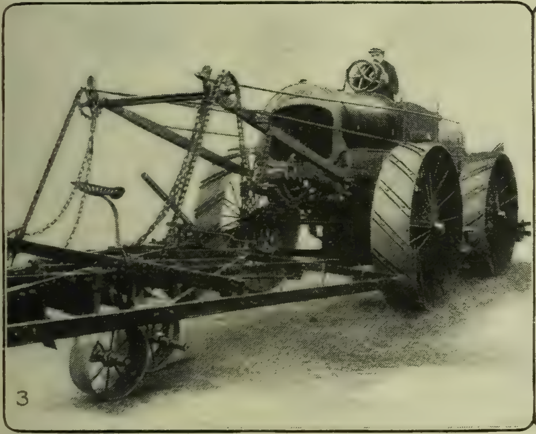
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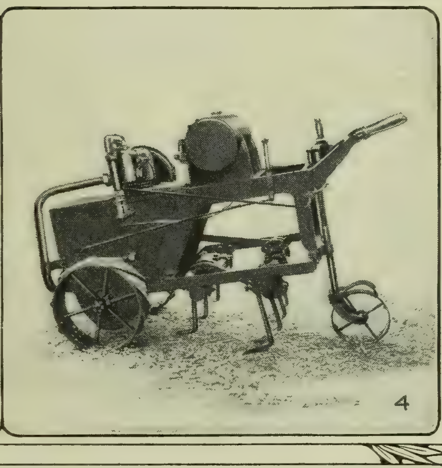
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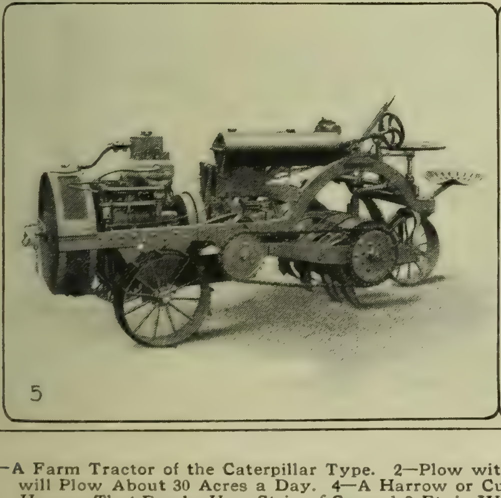
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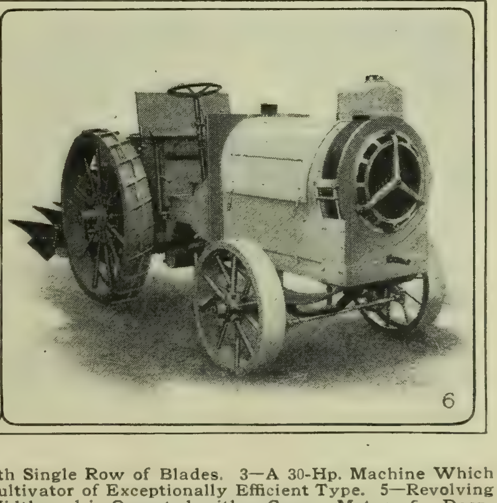
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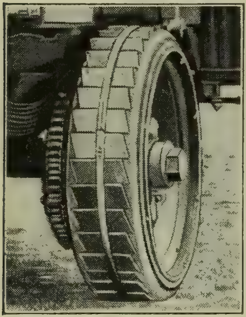
1—A Farm Tractor of the Caterpillar Type. 2—Plow with Single Row of Blades. 3—A 30-Hp. Machine Which will Plow About 30 Acres a Day. 4—A Harrow or Cultivator of Exceptionally Efficient Type. 5—Revolving Harrow That Breaks Up a Strip of Ground 3 Ft. in Width and is Operated with a Gnome Motor, 6—Deep-Cutting Motor Plow for Subsoil Work, but Which can Also be Used for Other Purposes

For many years the United States has been the unquestioned leader in the manufacture of farm implements, but France has entered into competition on motor farm implements, and some of the machines produced by the French manufacturers are shown above.

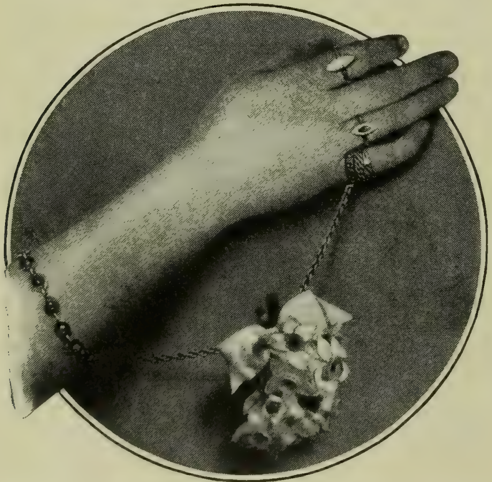
ARMOR FOR MOTOR TRUCK DUAL TIRES



An automobile accessories concern in Cleveland is manufacturing an armor which is designed to take the wear off solid tires and at the same time provide a good traction surface on the tread. Arranged for dual tires, the armor consists of a series of steel plates with an indention in the middle which fits the space between the two treads. The plates are held in place by a band which passes around the circumference of the wheel, resting in the depression between the treads.

THE FLORAL-LOOP NOVELTY

An interesting jewelry novelty for evening wear is shown in the accompanying illustration in the form of a floral jewelry loop arrangement. A neat gold chain is looped from a ring on the little finger to an arm bracelet, and a little bouquet is clipped to the center of the chain.



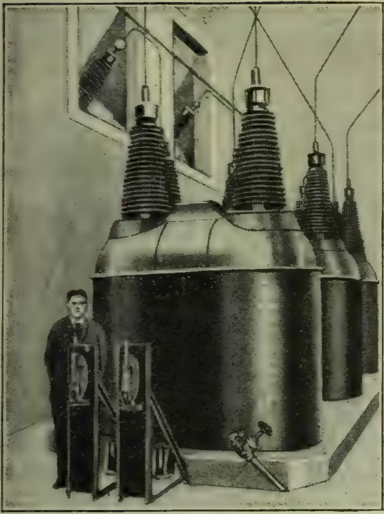
The Floral Loop is an Interesting Novelty in Jewelry

ODD BEHAVIOR OF METALLIC-FILAMENT LAMPS

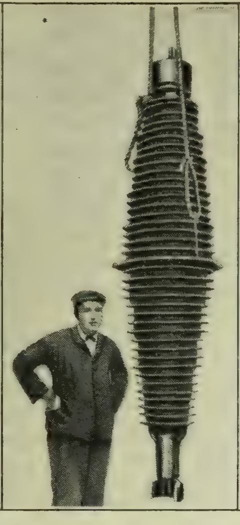
No doubt everyone who has had occasion to turn on metallic-filament lamps, has observed that the luminosity of the filament, at first, seems stronger than later on. The explanation which first suggests itself as a solution of this phenomenon is that the filament has a much less resistance at low than at high temperatures, so that, at first, more current would flow through the filament and cause a higher degree of incandescence. If this explanation be accepted, it would follow that the temperature of the filament adjusts itself more rapidly than the resistance, or, in other words, that there is a lag in the change of the resistance behind that of the temperature. This does not seem probable, however, and therefore attempts have been made to explain the phenomenon in some other way.

It was suggested, at first, that the pupil of the eye failed to adjust itself properly. The pupil of the eye contracts when the light is turned on, and more light is received at first before the pupil has had time to respond than a moment later. Experiments made with photographic apparatus showed, however, that this could not be the correct explanation.

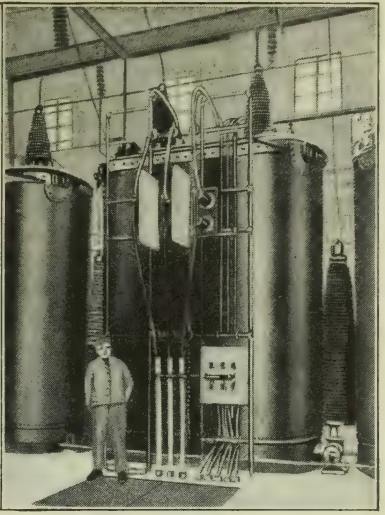
Another explanation, which seems to be more satisfactory, is that the true cause lies in the connections that are fused in the lamp bulb. It is suggested that the temperature of these leads rises more slowly than that of the filament, and for a very short time, at the instant of lighting the lamp, tends to decrease the total resistance, and thus cause an increased current. Still another suggested explanation is that the residual gas in the globe is the cause. The vacuum in the lamp is somewhat higher when the lamp is cold because the glass walls of the lamp absorb some of the gas. With an increase in heat, the gas expands and diffuses toward the center of the globe thus increasing the loss of heat by conduction.



The 140,000-Volt Oil Switches



Terminal Bushing and Contact

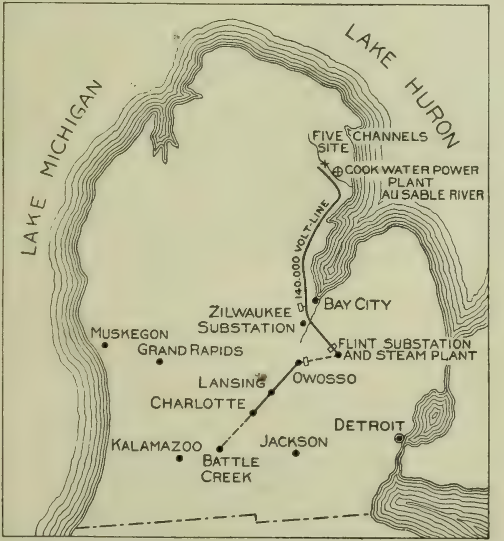


One of the Huge Transformers

WORLD'S HIGHEST-VOLTAGE TRANSMISSION LINE

The 140,000-volt transmission line that was recently put into operation in the state of Michigan marks another step forward in the utilization of high voltage for the transmission of electric energy. In transmitting at 140,000 volts, the builders have effected a saving in copper of almost 50 per cent, as compared with the quantities used in the highest-voltage lines previously constructed.

The transformers, oil switches, and lightning arresters used in connection with this line had to be specially designed to withstand the exceedingly high electrical pressure to which they would be subjected.



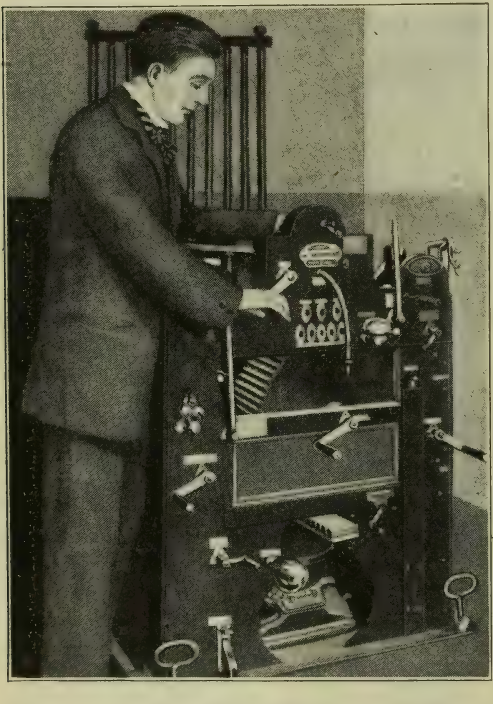
Map Showing the Michigan Cities and Towns Fed by the 140,000-Volt Line

The generators, which are driven by water turbines, deliver their output to the transformers at 2,500 volts. The transformers, which are oil-insulated and water-cooled, raise the voltage from 2,500 volts to 140,000 volts, and deliver the electrical energy to the line through massive oil switches. The transformers are 19 ft. 6 in. from the floor level to the top of the high-tension terminals, and each weighs approximately 43 tons.

The transmission conductors, which are made up of seven No. 8 gauge wires, drawn according to special specifications, are supported on tripod steel towers, spaced about 500 ft. apart. The heights of the towers vary, depending upon the contour of the country; in one case the earth had to be excavated to clear the wires, while 167-ft. towers support a 600-ft. span across a river. In hanging the conductors, each conductor being held to its crossarm by a string of ten 10-in. disk insulators, a dynamometer was used, and a pull of about 1,200 lb. made on each, which allowed approximately a 12-ft. sag in each span.

It is interesting to note that there is a rise in electrical pressure along this transmission line, which is due to a property of the line called its condensive reactance, and amounts in this case to about 30,000 volts. It must be understood that the above is not a characteristic of this line alone, but of all high-tension transmission lines, nor does this rise in voltage represent a gain in energy. The effect of condensive reactance in this case exceeds that of any other line on record.

IMPROVED MOTION-PICTURE SOUND MAKER



An Ingenious Sound-Making Machine for Motion-Picture Theaters

The assembling together in one apparatus of the many mechanisms required to produce realistic imitations of all the sounds used in giving "life" to motion pictures has been ingeniously accomplished in the machine here shown. The sounds it can reproduce include the cries of a baby, the screech of projectiles fired from cannon, the warbling of a bird, the ring of the anvil, the rustling of leaves, the crashing of falling masses of metal or wood, the engine noises of automobiles and motorcycles, the patter of rain, the rumbling of trains, the sound of waves, wind, hail, the puff of a railway locomotive, the breaking of crockery, the tolling of bells, the clang of fire bells, the clatter of horses' hoofs, the bark of a dog, the hissing and spitting of cats, the tinkle of sleigh bells, the "honk" of automobile horns, quick-firing guns in action, the clash of dueling swords, and the rattle of fetters.

The claim is made that despite its many functions it is very simple to handle.

WAR AEROPLANES AS "DOVES OF PEACE"

Unusual and remarkable as it may seem, the Italian war aeroplanes that have been almost constantly flying over the enemy's camps in Tripoli have recently been varying the diet of bombs by dropping pamphlets printed in Arabic. These pamphlets, addressed to the Turkish soldiers and their Arab allies, and to the inhabitants of Tripoli, Bengazi, Derna, Tobruk, and Fezzan, deal with the state of the war, telling of Italian victories and advising the laying down of arms.

¶A Berlin nerve specialist has reached the conclusion that knitting in bed is an excellent antidote for tired nerves, and has secured most satisfactory results by prescribing a course of knitting for worn-out society women of the German capital.

HOW A CAT TURNS OVER

A Man Falling from a Balloon Could Do the Same Thing, and Our Latitude Could Be Changed by the Same Method

By FOREST RAY MOULTON,

University of Chicago

IT IS a common saying that if a cat is dropped in any way whatever, it will always alight on its feet. Since a man cannot lift himself by his boot-straps, or a boat cannot propel itself through the water except by pressing against the water in some way, one may well wonder whether this is not one of the common sayings which is fallacious. The general principles involved are of such interest that the question was taken up a few years ago for consideration at a session of a French scientific society.

It is a fact that it is dynamically possible for a cat to turn over no matter how dropped, and experiments have shown that they actually do it. If a balloonist, or airman, should fall from a great height and should find that he were descending so as to strike on his head, he could turn himself over so as to strike upon his feet, if he knew the proper means of accomplishing it. But the distance he would have to fall in order to have time to turn over would be so great that he could have only an academic interest in striking on his feet rather than on his head, for the final result to him would be the same in either case.

In order to make the principles which are involved perfectly clear, suppose A B C D (Fig. 1) is a portion of a wheel supported at O, and that it is mounted so that it can be turned around O as an axis without any friction. Suppose A B C D is in a horizontal plane, and that on it two mice live and have their nest. Suppose they find that their nest is exposed to the north wind and that they wish to turn the portion of the wheel on which it rests around so that it will be protected from the wintry blasts and will be open to the sun's rays from the south. Suppose these mice are familiar with the principles of mechanics (having read Popular Mechanics every month) and that they undertake to turn their home around. Suppose they weigh but an ounce and that the weight of that portion of the wheel on which they live is 10 lb., or 160 oz.

Now the mice being wise will start at O and one will walk toward A and the other toward C so as to keep a balance. Their traveling along a radius of the wheel will have no effect upon it and will not turn it. After arriving at A and C they will walk toward B and D respectively. The way the mouse gets forward is by pushing back on the surface on which he is walking, just as a skater, in order to get forward on the ice, pushes back with the sharp edge of one skate as he makes the stroke with the other. This is a universal principle and is illustrated by a locomotive pulling a train. If the track is slippery so that the drivewheels cannot push back upon it, the train cannot start. In order to secure the necessary friction, the engineer puts sand on the track.

When the mice were walking from O to A and C they were pushing back in opposite directions. But when they walk from A and C toward B and D respectively, they both push on the wheel in the same direction. Since the wheel can move without friction, it will move back a little in this direction. The amount it moves depends upon the force with which the mice push back. Since the wheel weighs 160 times as much as the mice, it will be pushed back 1/160 as far as they go forward. (This is really under the assumption that its weight is all in its rim.) When they get to B and D the wheel has been pushed back 1/160 of the distance AB.

It is very important for the understanding of the subject to notice one or two things. The momentum of the mice forward is always exactly equal to the momentum (technically moment of momentum) of the wheel backward. When they arrive at B and D they must stop before they can go toward O. In order to stop they must have some friction with the wheel, and in stopping they push on the wheel in the opposite direction to that which they pushed while they were walking. In stopping themselves they will push on the wheel exactly enough to stop it. Hence they start at A and C with the wheel at rest, and they end at B and D with it at rest. It has had no motion except in the direction opposite to that in which they traveled, and therefore it has rotated backward somewhat. The center of gravity of the two portions of the rim and the mice has not changed; and since the mice have gone forward from A to B and from C to D the center of gravity of the parts AB and CD have moved back correspondingly. The wheel moved only when the mice moved, and stopped when they stopped. If the wheel were originally spinning round and round, the walking of the mice would change its position, but not its motion, after they stopped, precisely as is done when it is initially at rest.

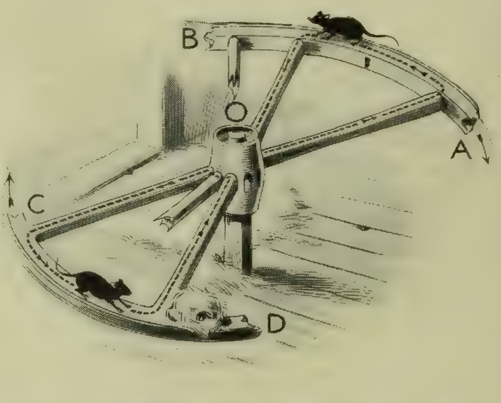


Fig. 1—Two Mice would be Able to Slowly Push a Broken Wheel Around by Running in Opposite Directions along the Rim Sections and Thus Change the Location of Their Nest

After the mice arrive at B and D and stop, they go back to O. Then they go to A and C and repeat the whole process. By doing this a few score times, they can turn the wheel around 180 degrees and secure the results they desire.

Now suppose a man were standing over the point O. Under the same conditions as to the absence of friction, he could turn himself around by moving his arms. He would extend his hands to A and C and then swing them around to B and D. By doing this, he would turn himself and the wheel on which he stood a little in the opposite direction. He would then pull in his arms to his body and put them out again in the direction AC, which would not turn the wheel. Repeating the process, he could turn the wheel as much as he wished.

Now suppose a man were falling from a great height. He would be perfectly free to turn in any direction, except for the slight resistance of the air to rotation, which can be neglected. If he were falling without turning over, he could work his arms so as to turn himself in any direction he desired, and the method which he would use is clear from the principles which have been explained. It has been found by careful observations of cats that they use their legs and head precisely in this manner to turn over when they are dropped. It is not, of course, to be supposed that the cats have any understanding of the mechanics of the problem; but that, by an instinct acquired by the cat family during thousands of generations, they naturally do what secures the results.

Everyone knows that our climate depends to a large extent upon our distance from the north pole. A glance at a map of North America shows that a large part of it is north of Chicago where sometimes for days and weeks the wintry blasts sift the snow through the streets. As the vast regions of Canada become more densely populated the rigors of its winters will be more and more deplored. The question arises whether it is not possible to tip the earth over so that the latitude of Canada will be less. This would bring Siberia and China nearer the pole, and the wind-swept and barren wastes of Northern Asia would become even more desolate than they are at present. Tipping the earth over is, of course, a bold proposition; but science has had so many and so remarkable triumphs in the last hundred years that no problem seems too big for it to undertake. It is not altogether a wild dream that man will sometime control the great forces of nature, and even direct the cosmic processes.

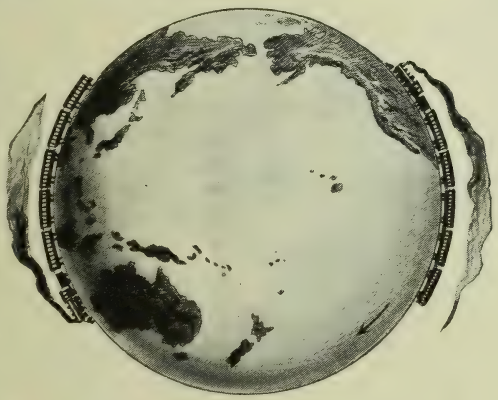


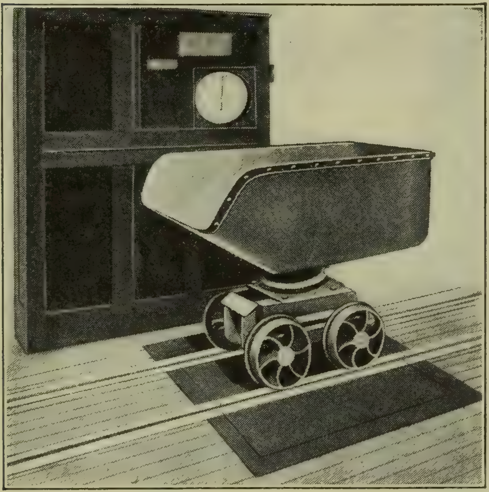
Fig. 2—The Earth might be Tipped Enough to Effect a Change in Latitude, if It were Possible to Run a Train around It Rapidly, along a Meridian between the North and South Poles

A small change in the latitude of North America might have a great influence on its climate by changing the atmospheric and ocean currents. Suppose it is proposed to change its latitude one degree. For simplicity, suppose the earth is not rotating and that it is possible to run a train around it from pole to pole along a meridian (Fig. 2). Suppose the track runs from the south pole to the north pole through North America and back to the south pole through Asia on the opposite side of the earth. If the train should pass northward on the American side, its wheels, pushing backward, would push this side of the earth away from the north pole; and, going southward on the Asiatic side, would shove that part of the earth toward the north pole. If the train should go round and round the earth enough times, the earth would be tipped over as far as might be desired.

Instead of being still, the earth is rotating; but this will not alter the effect of the train for, according to the principles which were explained in connection with the mice on the wheel, a rotation of the whole mass does not change the effect of a body moving on it, and after the moving body stops, its rotation is unchanged. Consequently, the train alters the rotation of the earth only while it is moving. In the second place, it would not be possible to build a railroad track around the earth from pole to pole, but the difference in results would be slight if it were turned off to the east or west in high latitudes. For long distances the trains would have to be carried by boats, but this would have the same effects on the earth, for the boats push back on the water as the trains do on the railroad tracks.

Now the question is whether so large a mass as the earth can be changed sensibly by the means available to man. The seriousness of the proposition becomes evident when we find that the total mass of the earth is six thousand billion billion tons. This number is 6 with 21 ciphers after it. Computation shows that if a hundred trains of 3,000 tons' weight, including the load, were run a thousand miles each day in the manner described, it would require 100,000 million years to change the latitude of North America one degree. Consequently, it seems that even though scientific men are bold, this is an undertaking which they cannot accomplish. There is more hope that, like the birds, we shall sometime be able to fly from the shores of the Arctic Ocean to the Caribbean with the change of the seasons.

AUTOMATIC TRACK SCALE



An Automatic Track Scale Which Indicates the Net Weight of Each Load, the Total of All the Net Weights, and Counts the Loads

A new type of automatic self-registering track scale, which may be operated by the movement of a hand lever or wheel, but preferably by a small electric motor, is being built by a scale company of Milwaukee, Wis. The scale is fitted with three counters, one of which indicates the net weight of each load, the second records the total of all the net weights passed over the machine, and the third counts the number of loads.

The action of the loaded truck coming upon the scale platform starts the weighing and recording mechanism by closing a clutch, causing a worm which is part of the steelyard to revolve and carry the poise weight until it reaches the balancing point. The instant the beam drops this weight stops traveling, and thus the net weight of the load is instantly and accurately recorded. The poise weight returns at high speed to the zero position as soon as the load is removed, and the scale is ready to receive a new load.

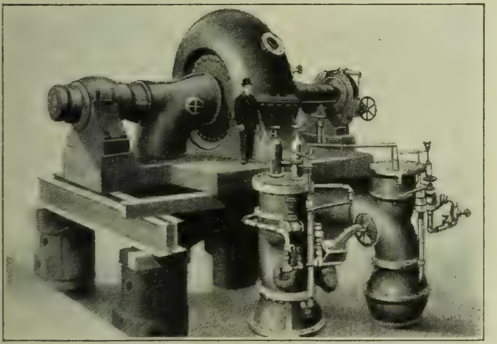
MOTOR CAR FOR HORSE TRANSPORTATION

The Mounts of a Fox Hunter in England are Taken to the Meet in a Special Motor Car

A well-known fox hunter of Bridlington, Eng., has had a special motor car constructed for the transportation of his hunting horses to Scarborough Hall, near Beverley, for the meet of the Holderness Hunt. The car accommodates three horses. Part of one of the side walls is dropped down, and, supported by wooden legs, serves as the gang-plank by means of which the horses enter and leave the car.

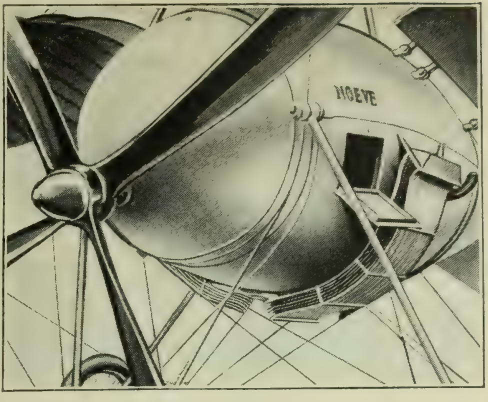
THE LARGEST WATER TURBINES

The largest and most powerful hydraulic turbines in the world are operated by the Pacific Coast Power Co., of Seattle, in the hydroelectric development of the White River. Each turbine was designed to develop 18,000 hp. at 360 revolutions per minute under 440 ft. effective head, and 20,400 hp. at the same speed with a maximum head of 480 ft. In actual operation, however, the turbines are each carrying 20,800 hp. under 440 ft. effective head. From a dead short circuit to no load, which requires a full gate motion by the governor from wide open to closed, the maximum speed does not exceed 395 revolutions per minute, or about 10 per cent above normal.


The Largest Water Turbine in the World. An Idea of Its Size may be Gained by Comparing It with the Man

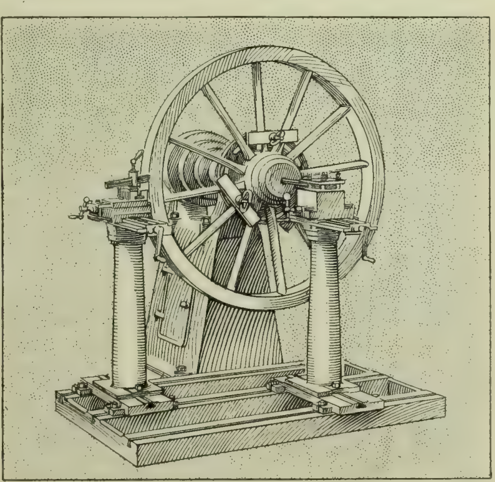
GERMAN ARMORED AEROPLANE

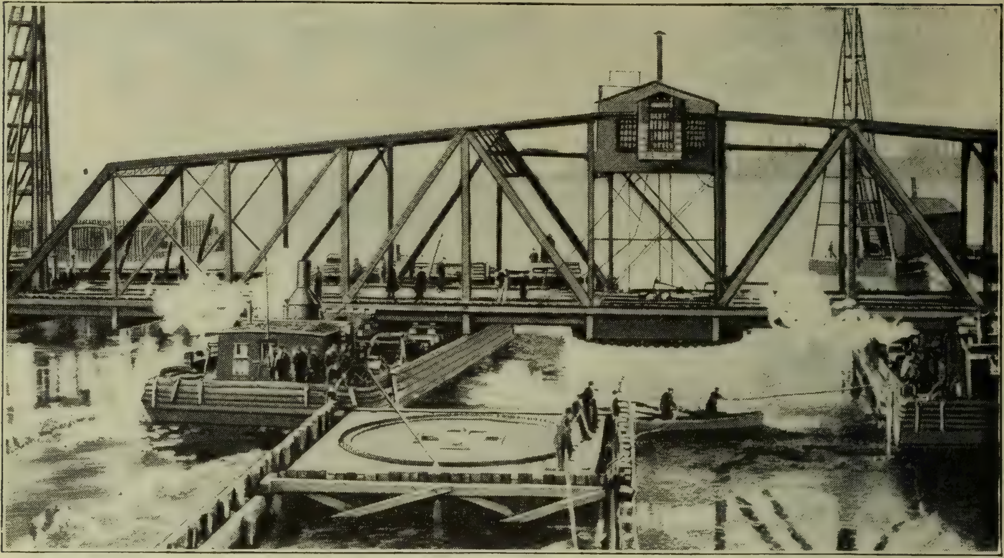
One of the interesting armored war aeroplanes shown at the recent aviation exhibition in Berlin is of the "seagull" type. The interesting feature of this machine is the armored cylinder provided to house and protect the machine's mechanism, the pilot and the "fighting airman," or, in other words, the officer whose duty is to operate the fighting mechanisms of the machine. The armored cylinder tapers to a point in front.


One of the Armored Aeroplanes Developed in Germany and Exhibited at the Recent Aeroplane Show in Berlin

MACHINE FOR TURNING AND BOXING WOODEN WHEELS

An English manufacturing concern has recently placed upon the market an interesting machine, especially designed for turning up and finishing the rims, and for boring or boxing the hubs of wooden wheels. It will handle wheels up to 6 ft. in diameter. Two compound slide rests are provided, one for turning up the rims and faces of the wheels, and the other for


A Machine Which Turns Up and Finishes the Rims, and Bores and Finishes the Hubs of Wooden Wheels



Shifting a 212-Ft. Span, Double-Track Railway Bridge to a New Location on the Passaic River, New Jersey. Service Over the Bridge was Interrupted Only One Day

boring and finishing the hubs. The columns which carry these slide rests can be clamped in various positions on the bedplate, which is attached to the main standard of the machine. They can be easily adjusted and locked in positions suited for wheels of different diameters.

HIGHEST-VOLTAGE DIRECT-CURRENT LOCOMOTIVE

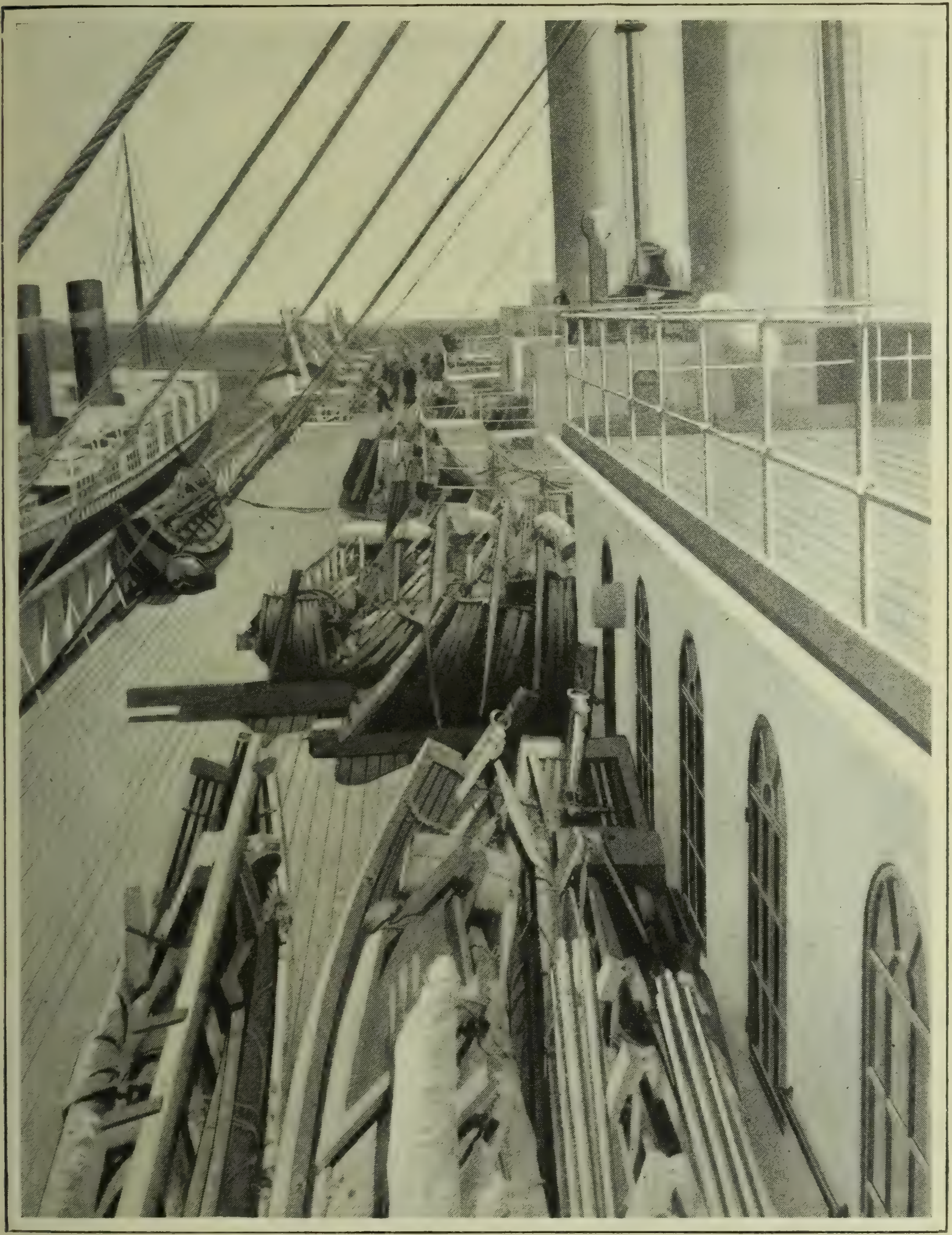
There has recently been built, by one of the large electrical manufacturing companies, a number of high-voltage direct-current locomotives, which will operate on a traction road in South Carolina. These locomotives will be supplied with power from a 1,500-volt, direct-current circuit, which is said to be the highest direct-current voltage used by any electric railway in the United States. The locomotives weigh approximately 55 tons each, and are equipped with four 750-volt motors which have a rating of 180 hp. Two motors will be connected in series, and the combination then connected to the 1,500-volt circuit. It is claimed each locomotive will be able to haul 40 loaded freight cars on a straight, level track at a speed of 20 miles per hour.

AN UNUSUAL BRIDGE-MOVING OPERATION

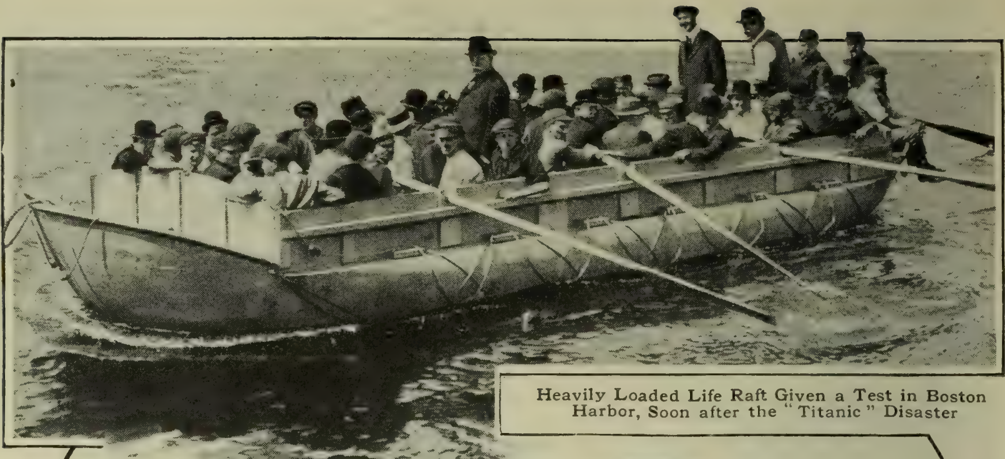
Recent changes in the line of the Central Railroad of New Jersey between Jersey City and Newark included the shifting of a 212-ft. span, double-track bridge, crossing the Passaic River, to a new location about 185 ft. distant. When the new pivot pier and approaches were ready for the span, preparations were made for the shift and Sunday was decided upon for the work, there being less navigation in the river and fewer trains on this day.

The contractor's forces arrived on the scene at two o'clock in the morning, and pulled out about 30 piles which interfered with the movement of the two 650-ton scows on which the span was to be moved. The scows, filled with about 5 ft. of water ballast, were then floated under the bridge, marks on the cribbing indicating the exact location necessary. Then the 12 sets of blocking were built up, and the water was pumped out of the scows, which, with a rising tide, lifted the bridge clear of its foundations within a very few minutes. Signal and interlocking systems were restored and traffic was resumed at six o'clock in the afternoon.

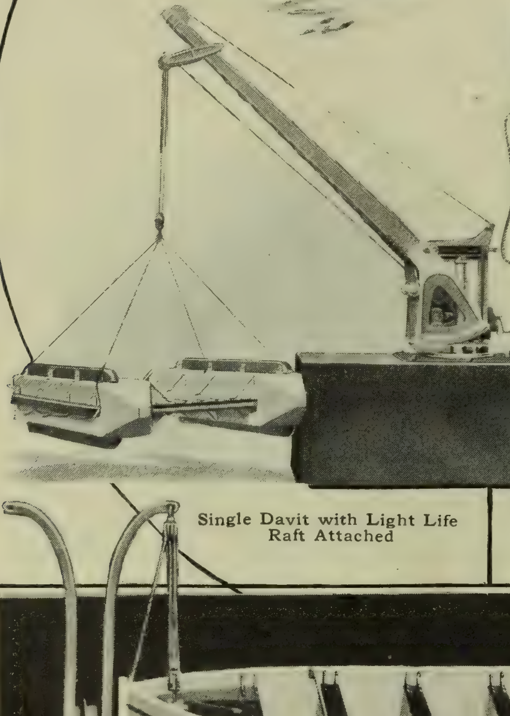
AWAKENING OF INTEREST IN SAFETY DEVICES



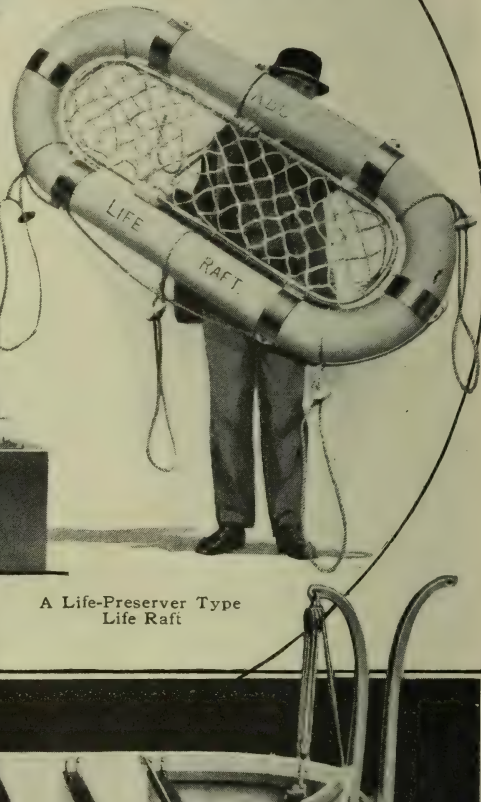
Suggestions for improvement in means of life-saving at sea come thick and fast after great sea disasters, and the loss of the "Titanic" is far from proving an exception. Inventors are announcing new schemes from all parts of Europe and America, and there is an awakened interest in devices at present in use. In the above illustration may be seen a number of the collapsible lifeboats provided the "Olympic" immediately after the loss of her sister ship. It was the appearance of these boats, which look frail and unreliable collapsed, that caused the strike of a portion of the crew of the "Olympic." The men left the ship at the last moment, and the White Star Line had to cancel the sailing and transfer the passengers to other ships.



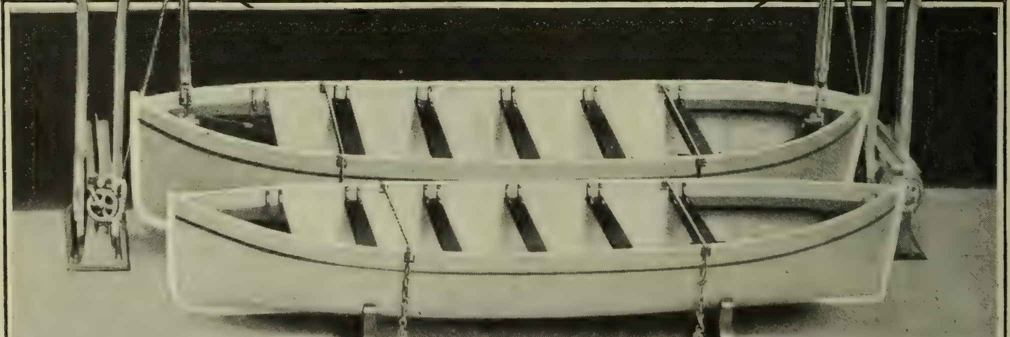
Heavily Loaded Life Raft Given a Test in Boston Harbor, Soon after the "Titanic" Disaster



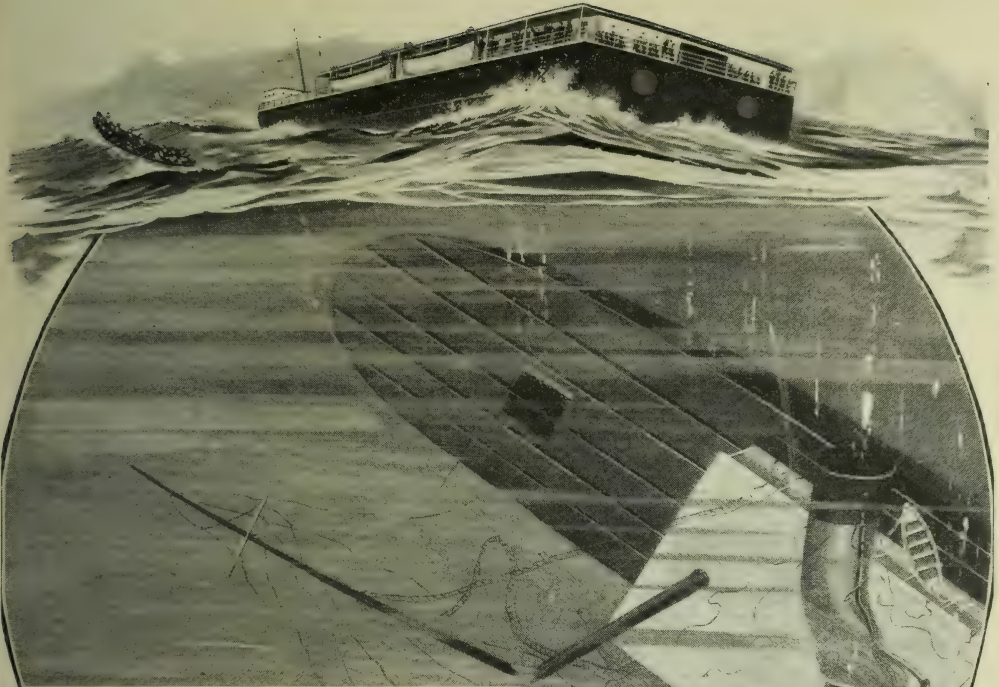
Single Davit with Light Life Raft Attached

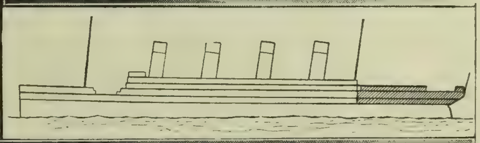


A Life-Preserver Type Life Raft



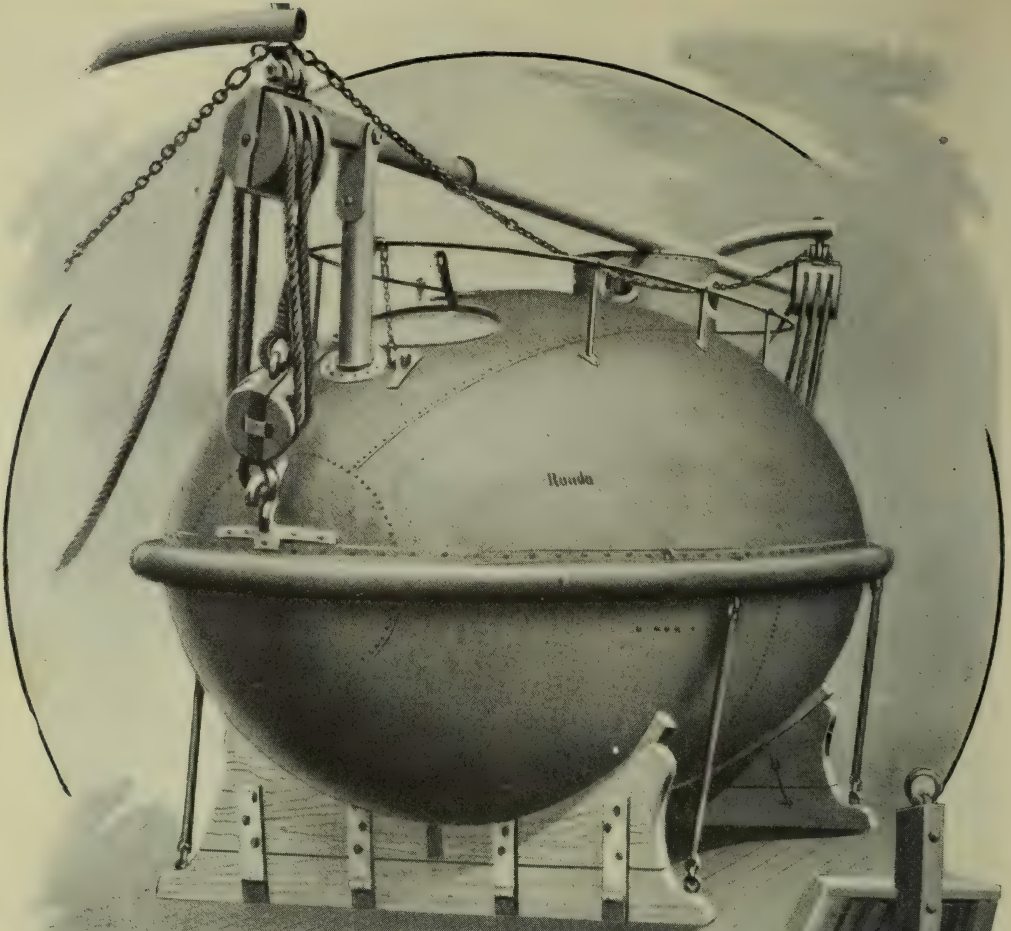
The "Titanic" was Equipped with More Davits than Boats. In This Illustration is Shown a Scheme for Providing Two Boats for Each Set of Davits





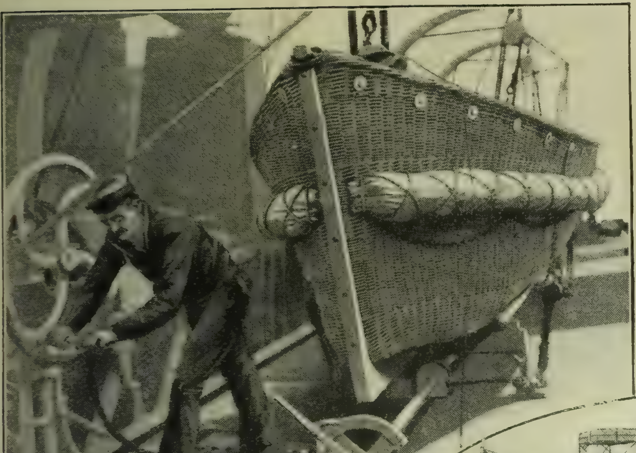
The Detachable Pontoon Idea; A Portion of the Upper Works so Constructed That It would Remain Afloat should the Vessel Sink

Placing Collapsible Lifeboats on Board the "Olympic"

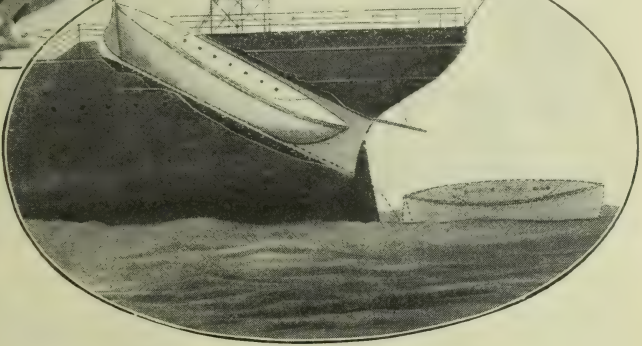


Lifeboat Built Like a Submarine. It can be Steered from Inside or Outside

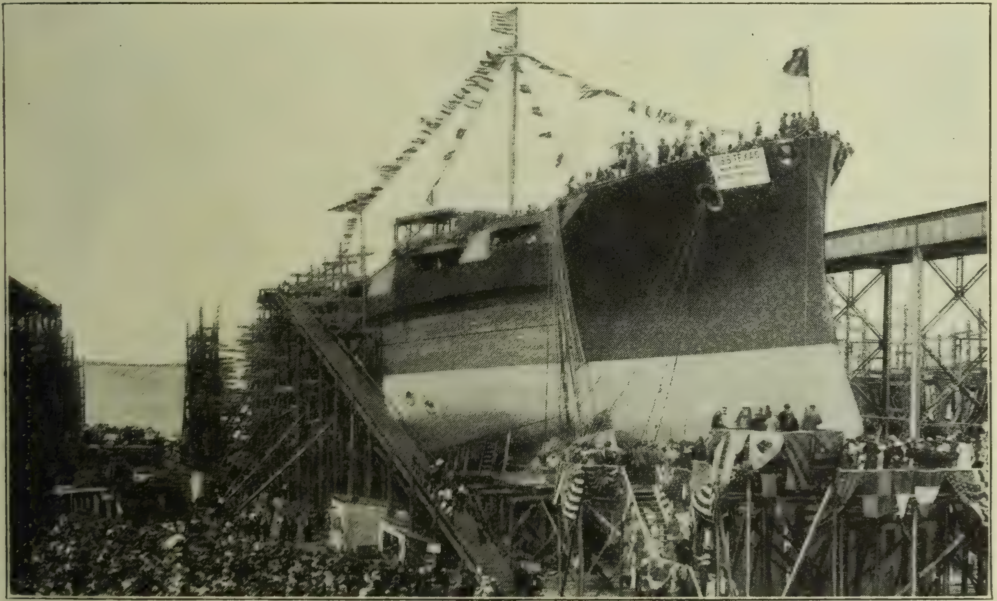
Opening Out One of the Collapsible Lifeboats. Many Liners Took Them on as "Extras" after the "Titanic" Disaster



The wickerwork lifeboat is one of several carried by the "Batavier III," of one of the Dutch lines. It weighs about as much as the ordinary wooden lifeboat, and carries 35 people. The outer shell of wickerwork prevents injury should the boat strike heavily against the side of the vessel when being lowered into a rough sea. Inside the wickerwork is a wooden shell consisting of three layers of wood with canvas between.



It is suggested that two launching tubes be constructed, one on each side of the stern of the vessel, for the launching of completely covered, motor-driven lifeboats of the type shown in the illustration. All the boats would be disposed on tracks leading along the deck to the entrance of the tubes.



Copyright, 1912, G. V. Buck, Washington.

The superdreadnought "Texas," the most powerful battleship of the world yet launched, was slid into the water at Newport News, Va., on May 18th. She has a length of 565 ft., a beam of 95 ft. 3 in., a displacement of 27,000 tons, and a contract speed of 21 knots (24.18 miles an hour). Her main battery will consist of ten 14-in. guns, and the secondary battery is composed of twenty-one 5-in. guns.

WHEN ROTHSCHILD, ROCKEFELLER, AND MORGAN ARE FORGOTTEN.
THE WATER
THE LAND
THE AIR
FULTON
STEPHENSON
WRIGHT

His First Public Flight, Le Mans, 1908

Wilbur Wright

In His First
Glider, 1900

Copyright, 1912, by John T. McCutcheon
—Chicago Tribune

WILBUR WRIGHT, INVENTOR OF THE AEROPLANE

BORN APRIL 16. 1867 DIED MAY 30, 1912

Acquiring a Motor Boat

by George Fitch

ONE of the greatest virtues of the motorboat is that almost anyone can own one. A motorboat is not an indication of an ungovernably large income. If a man cannot afford to buy a mahogany-skinned racer, with 200 horsepower stuffed into its narrow thorax, he can pick up a second-hand runabout, with an old four-cylinder engine which counts one and skips two until it has run a few miles and is thoroughly hot. If this is beyond him, he can pick up a homemade boat with two cylinders, a cast-iron propeller and a steering wheel made out of an old slat. If even this is too much luxury, he can beg or borrow a rowboat and install in it a mail-order engine which costs $49.50, and on which he can lavish just as much care and exertion and ingenuity and hoarse, reverberating profanity as if it had cost $7,000, and were built of aluminum and vanadium steel.

I was told the very best way to get a motorboat is to buy it second-hand. There are many reasons. In the first place the price of a motorboat decreases much faster than its efficiency. When a man has run a thousand-dollar motorboat a year, he has corrected most of its faults and has discovered all of the peculiar kinks in the disposition of the engine. The boat is really worth more than it was when he bought it, but you can generally coax it away from him for $400. A man who builds a boat himself—puts $50 worth of lumber, $300 worth of engine and $1,000 worth of time and brains into it—will sell it with the utmost cheerfulness for $250 just as soon as he has figured out a change of design which makes it imperative that he should build a new boat with a bigger engine. Often, too, you can discover some man who will never learn to run a motorboat because his brain wasn't made to focus on the subject. He is forever starting off with the water drained out of his engine, or with weak batteries, or with no gasoline, or without remembering to turn on the lubricating oil. He cranks his engine for two hours before he remembers to prime it. He spends a summer taking friends out to ride, and listening to their comments and jeers while he struggles with his stationary boat. There are times during the summer when he will sell that boat for $50 and will think with gratitude of the man who buys it. It is well, therefore, to seek out these men and to linger near them with an expectant eye like an undertaker attending an automobile race.

It is even possible to obtain a boat

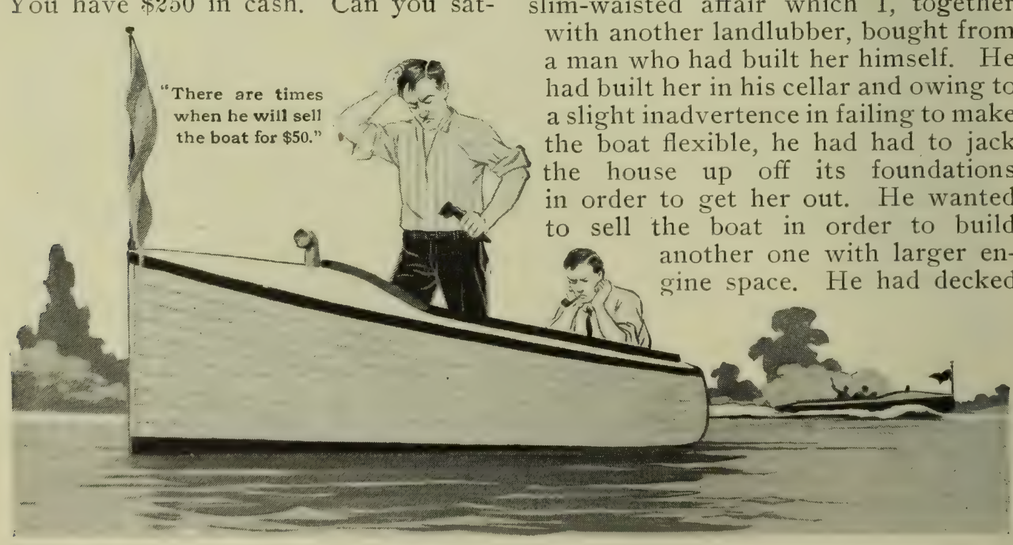
without any cost at all. But this is dangerous and the givee should beware. I myself was presented with a $3,000 boat once. It hadn't cost all of that in the beginning, but the owner had spent that much money on it. He did not like me, so he gave me the boat. I was inexperienced and accepted it. I traveled nine miles in it that summer at an average cost of $5 a mile, while the former owner sat on the bank and watched me with a grim, but happy smile. He said, the only pleasure he ever had out of that boat was watching me try to run it. In the case of boats you should look gift-horses in the crankshaft, the flywheel, the clutch, the commutator and the stuffing box, before accepting them.

Right in my own town another man has been trying, for three years, to give away a 48-ft. speed hull, built magnificently of oak timbers, with a 2 by 6 oak coaming, and ribs about as thick as corset steels. But he has made no headway, though he swears that it does not sag more than 6 in. in the middle with an engine in, and that the report that he had to feed it gasoline with a force pump is sheer slander.

Suppose you have reached that stage where life is no longer attractive unless you can soak it in gasoline, lubricating oil and river water, and you have determined to buy a motorboat. You have $250 in cash. Can you satisfy your yearning with this amount? Easily. But don't rush into the business recklessly. Buying a boat is more of a job than buying an automobile, or an aeroplane, or a house and lot. It requires caution. There are diplomatic possibilities to it. There are also other possibilities. You can very easily buy a $125 boat for $250. Lots of people do it. It doesn't take any practice at all on your part. Dealing with a boat owner is like dealing with the proprietor of a wall-eyed Connecticut horse. Cash is only the last item in the transaction. Conversation, and a plenty of it, comes first.

To begin with, don't buy the boat yourself. Find a friend who is a boat expert and let him do the negotiating for you, while you stand by with your checkbook hidden, but instantly available, ready to pull it out at the psychological moment, buy the boat and go away with it before the owner gets lonesome for it and refuses to carry out his bargain—for there are few boats which, with all their faults, aren't loved by the owners. More than one man has sold his boat and has bought it back eagerly for $50 more the next week, after trying unsuccessfully to win the love of a strange and sullen engine in a new boat.

My first boat was a nervous little slim-waisted affair which I, together with another landlubber, bought from a man who had built her himself. He had built her in his cellar and owing to a slight inadvertence in failing to make the boat flexible, he had had to jack the house up off its foundations in order to get her out. He wanted to sell the boat in order to build another one with larger engine space. He had decked



"There are times when he will sell the boat for $50."

the engine in and, being a fat man, had had to use glove powder in squeezing past it in order to reach the crank. He was willing to sell for $300, we understood, and we were willing to buy for that sum, having sequestered it from the voracious cost of living after a hard struggle. But when we told our plans to our friend Green, who knows motorboats as grandmothers know babies, he scoffed loudly. "It's lucky you innocents came to me," he declared. "I would never feel innocent again if I let you go off by yourselves and buy that boat. Give me your money and come with me. I'll buy it for you."

We followed Green up to the dock where the boat lay, and found her owner near by. Waving us aside, Green opened negotiations. He began cautiously, almost stealthily, approaching the subject from the rear, and with no indication of any interest in it whatever.

"We just dropped down to look at the boat," he said casually. "These queer old-timers are sort of interesting nowadays." He poked around her seams with a pen knife. "Pretty rotten, isn't she?"

"She was new last winter. I built her myself. I've put over $22 of brand new equipment in her this year," said the owner promptly. "She's the steadiest boat on the river."

"Um," said Green, inspecting the engine. "I suppose she's as steady as any other dock. You don't presume to run her with that mess in there, do you?"

The owner was grieved. "Run her!" he shouted. "Why, man, she ain't missed a pop all summer. She's got a world of power. That engine has never failed to run. A quarter turn will start her every time—"

"You must have run her about 10,000 miles," said Green, examining some more. "That engine is on its last legs. There isn't a bearing left in her. She hasn't got as much compression as an old corset. It will take one hundred dollars to put that engine in shape, and it wasn't worth that new."

"It wasn't!" yelled the owner. "I paid $225 for that engine and I got a dealer's discount at that; and I've put in a clutch and a new set of coils and a magneto since then, and a new storage battery—"

"You'd have done better to put in a horse," said Green, cruelly. "Where did you get your idea for this model? A houseboat would look like a racer beside this scow. You must have dreamed this plan after a lobster supper."

"She does eight miles an hour all day long with that little bit of an engine," snorted the owner, instantly abandoning the machinery and coming to the rescue of the boat. "She's the best model on the river. If I had any power in her she'd make 12 at least."

"Nice stern you've got," said Green. "Sort of a standing invitation for a sea to come aboard and make itself at home, eh? No wonder you built a chicken coop over your engine. You'd have to bail this thing with a steam pump in a sea. What do you want for her?"

"Seek out these men and linger near them like an undertaker."

By this time we two real buyers were looking nervously for a street car. We didn't want a death trap. We were grateful to Green, but we wanted to go away. The owner might try to give us the boat and we might be tempted to take it.

"She stands me in seven hundred, not counting my time," said the owner. "I wouldn't sell her for anything, but a fellow has given me a big engine and I want to build a speed boat. I'll take $300 cash, and I'll paint her up first class."

"Three hundred!" yelled Green. "Three hundred for that ark? Why, it would cost that much to put her in shape so that she could beat a duck in a fair race."

The owner was pained. "Ding it! Man, she's in perfect shape," he protested. "I've just overhauled her. She's got brand new cork cushions, too, and a searchlight."

"He had built her in his cellar, and, owing to a slight had to jack the house up off its

"She's got to be caulked and that rudder gear wouldn't be safe to use on a butter boat," said Green.

"A man offered me four hundred for her last week," said the owner, "but he wanted to use her for towing sand-barges and I wouldn't let her go for no such purpose. She's a bargain at three hundred. She's got a full charge in her storage battery and a nice flag."

"That gasoline tank's tin."

"The feed pipe's lead."

"She's hogged in the middle."

"I just put a new rudder on her, too."

"I'll give you $150, and not a cent more," said Green. "We couldn't use her to run with, but we might get some salvage out of her brass."

"Two-seventy-five's my bottom figure. There's a fellow from Pekin wants her for three hundred, and he's coming tomorrow. She's got copper paint on her bottom."

"Yes, and that's about all the bottom she's got," said Green. "I'll give you $225."

"Done," said the man with paralyzing swiftness. "I've got a blank bill of sale right here."

We watched proceedings somewhat dazed and made out the check as Green ordered. Then we shook hands over the bargain, and after he had left we took Green by the throat and asked him why he had bought a prehistoric death trap for us?"

"She's a peach of a boat," said Green, joyfully. "She's worth $400 at the least."

"But she leaks, and her engine's no good, and she's got no bottom!" I objected.

"Shucks," said Green. "She's the best bargain on the river. But if you'd believed all he said you'd have had to pay $500."

Gradually Green's method dawned on us and we were properly jubilant. "We've got $75 left to run her on this

inadvertence in failing to make the boat flexible, he foundations in order to get her out."

summer," I declared joyfully. "We intended to spend $300 on that boat."

"So you will," said Green menacingly. "That's just about what she will cost you."

Later we found that he came within five dollars of the truth. For when we went to get the boat we found that the owner had artfully removed such things as had not been mentioned in the bargaining, including all the tools, the acetylene tank, the batteries, the anchor, the side lights and the life preservers—and also that the boat had no propeller, and that the timer was a broken reed. But aside from that she was a very good boat and we enjoyed her frabjously.

It is astounding how much boat can occasionally be bought for a little money. Later on, my partner and I bought a 30-ft. cabin boat with a good, heavy-duty 8-hp. engine in it, magneto, storage batteries and kitchen outfit for $200. The builder had put oak frames and brass screws all through it, and had built it to ram battleships. But she was not malaria proof, so he sold her to a friend for $600. This friend, who was eminently fitted for buying old masters and costly books, tried all one summer to make the engine run with a disconnected wire, and will not, even now, allow us to mention the boat in his presence. We have since run the boat upward of 1,500 miles during two seasons, at a total cost for repairs, dockage, improvements, and gasoline, of $300.

That works out at the rate of 20 cents a mile, which is not exactly cheap traveling. But there is one comfort. You can travel all day in a boat of this sort and not use up more than 60 miles of the 1,500—and by the time you have towed the boat in from her anchorage, have made necessary repairs, have coaxed the engine out of the dumps, and have run five joyous, sea-splashed miles, you have put in a very pleasant afternoon for two, or four or six people—which is cheaper than going to vaudeville or baseball. We always figure on four miles for each gallon of gasoline—it takes more power to plow through water than to run over land—and on long trips we allow our guests to pay for the gasoline, and also to carry it down to the river from the supply stations. It gives them a sense of responsibility and personal interest and is really a favor to them.

The cheapness of second-hand boats, however, is only equaled by the hideous cost of engine repairs. I have learned to look at engine experts with fear and to shudder apprehensively whenever my engine develops any affection which may call for an operation. A year ago we wanted to have the bearings of the Siwash engine overhauled. The proprietor of a machine shop came up with a helper and a horse and wagon—each separate item of the above drawing 80 cents an hour—and took the engine away to his lair. We tried several times to rescue it, but unsuccessfully. It had been dismembered and for a month it lay around the machine shop in fragments, while at odd times, when business was slack, the proprietor, or his assistant, or the drayman, or the delivery boy would go and do $1.60, or $2.40, or $4.80, or $6.40 worth of work on it. When it came back the bearings had been tightened, the flywheel loosened, the spark plugs polished, the crank-draw filed, the piston rings replaced, the gasoline connection lost, and the timer manicured. The bill was $43.20 and when the thing refused to run the proprietor declined to come up and look at the corpse for less than 60 cents an hour. He knocked off the 20 cents as a concession to old customers.

Since then we have made our own repairs and we have adhered rigidly to one rule. We do not repair the engine as long as it will run. When it ceases to run and makes funny noises in its abdomen, and spits blue smoke and flames at us, and finally becomes cold and dead and limp in the crankshaft, we reluctantly hold a post-mortem and allow an expert to enter the boat, under heavy guard, and with the threat that if he attempts to repair the water line, and the horizon, and the flag staff, over and above the specified job, death on the spot shall be his portion.

COMPULSORY DATING OF AUTOMOBILE TIRES

Bills have been passed, or are pending, in several of the state legislatures, notably those of Minnesota, Georgia and New York, to make the dating of automobile tires compulsory. The principal clause of the New York bill requires that "no person or corporation shall manufacture, sell, offer, or expose for sale a tire for use on a motor vehicle, unless the date when such tire was manufactured shall be impressed or branded upon the material whereof such tire is constructed, or otherwise indicated by label securely attached thereto. Every person or corporation violating this section shall be liable to a penalty of $50 for each violation."

An amendment tacked onto the bill, however, made the bill a joke, according to some critics. This amendment relieves the manufacturer from any responsibility for the dating of the tires and places it upon the retail dealer, who has no means of knowing the date of manufacture. This amendment also allows the dealer to apply the date with a rubber stamp.

COMMENT AND REVIEW

Aeroplanes Come High

AFTER long deliberation and much experimenting England has finally acknowledged the necessity of the aeroplane in modern warfare, and has placed its seal of approval thereon with an initial order for 60 machines. This number will be increased to 100 just as soon as a sufficient number of sky pilots can be trained to navigate them. To fully appreciate the importance which this arm of the service has already attained one must note the appropriations for the current year, by the three great continental powers. France will spend $6,250,000—a sum sufficient to build a very fair warship; Germany, $3,500,000; and Britain, $1,500,000. A total for three countries of $11,250,000, thus illustrating the increasing and high cost of military living.

* * *

Turn Waste into Wealth

THE floods which have swept down the thousand and more miles of Mississippi Valley this year have been unusual because of the more than ordinary loss of life and property. Each year, with patient regularity, about so many thousand settlers along the great watercourse leave their homes and betake themselves and families and live stock to points of land above normal high water. When the flood has passed they return to water-soaked homes, in good condition to contract the various types of sickness which always follow in the wake of an overflow. Even such a deluge as the long-to-be-remembered one of 1912 fails to dislodge any considerable number. Man has much of the habit of the wild animal in this respect, as shown in hamlets and towns rebuilt where the avalanche, flood, eruption, tidal wave and other convulsions of nature have blotted out existence. And in all these instances there is little or nothing the immediate sufferer can do to prevent a recurrence.

Of the disasters mentioned, the flood alone is capable of prevention, and the remedy lies not where the flood is found, but back at its many sources. The undertaking in the case of the Mississippi is so vast that prevention is not likely to be attained for many years, though eventually it doubtless will, through an economic condition. If a sufficient number of controllable tributaries should be dammed to hold back one-half or even one-third of the water released each spring, it would not be difficult to handle the volume flowing via the Mississippi with comparative safety. The cost of this control would run into vast sums, and therefore can be accomplished but slowly. If, however, the entrained waters were released through turbines and thus made to produce power, and the same water used over and over again, a sufficiently large revenue might result to meet, or nearly so, the interest on the cost of such construction. And if this direct revenue could be supplemented by a part of the saving from what would otherwise be a large loss, the sum total should make the undertaking at least self-supporting. Obviously the plan could only be effectively worked through Federal control with the coöperation of the several states involved; but with the Panama Canal as an example, the project is far from impossible or impracticable. Perhaps the idea also contains a suggestion as to what to do with our convicts. In work of this nature they could be massed and kept employed for months or years in one place, under conditions which would be alike favorable to the State and to the prisoners.

Bill to Bombard 'Bergs

A BILL was introduced in Congress the other day which confirms the growing belief that what this country needs in its legislative halls is fewer politicians and more men of practical business experience. The bill referred to is for the appropriation of One Hundred Thousand Dollars with which the Secretary of the Navy is to "ascertain whether the target practice of warships and the use of explosives dropped from airships" may supply a means of destroying icebergs. Even the freshest recruit on board ship might reasonably be expected to hit the April ice field which was reported to be 12 miles wide and 65 miles long; but with such a target as that the best gunners and the heaviest shot could effect about as much damage as a small boy with a bean blower. However the bill to bombard 'bergs had not advanced to the point of burning powder when these lines were written.

* * *

Senate Committee Report

THE report of the Senate Committee on the "Titanic" disaster is satisfying to our own people. It should cause those British journals which have sought to pour ridicule upon the investigation, and especially upon Chairman Senator Smith, to realize how childishly they have acted. The report does not hesitate to place prime responsibility where it belongs—upon the unfortunate Captain Smith—but does it in no resentful or carping manner. The tenor of the report is to so present facts, based on undisputed testimony, that hereafter the passenger on Atlantic liners shall be safeguarded to the fullest extent possible.

The British investigation, which is still in progress, started out with the evident intention to minimize responsibility and to whitewash the management, officers and crew. The results of the investigation on this side had, however, been published in England, and public opinion so strongly insisted on having the truth that after a few days of nibbling at the edges, the court ventured on fairly thorough work. It is evident, however, that in the absence of public information, made possible only by our Senate investigation, the full measure of incompetence, unpreparedness, and utter disregard of the rudimental laws of safety would never have been revealed.

The insults heaped upon Senator Smith by the British press serve but to emphasize the service he has done humanity in exposing conditions little dreamed of, and which, now known, will result in great reforms.

* * *

Wireless Needs Men

THE inestimable service which the wireless rendered in the rescue of the "Titanic" survivors is alone sufficient to immortalize the name of Marconi; in the confusion and excitement of events the daily press paid scant praise to the great inventor, who already has saved nearly 5,000 lives. It is very apparent, however, that the continued employment of beardless youths in the wireless station of passenger liners must cease. Positions involving so momentous responsibilities are not in the nature of things fully realized by boys in their teens. This is one of the reforms international conference must secure, and should require not only examination as to wireless ability, but even more as to fitness of operators. That the mere sending or receiving of wireless is anything but difficult is attested by the thousands of grammar and high-school boys who are already operating for pleasure, but the qualities of mature judgment and endurance are a prime necessity. Moreover, a reasonable number of Atlantic steamers should, when crossing, be required to maintain unbroken attendance in the "spark house," not for their own advantage, but to provide for the receiving of distress messages from other vessels.

If governments should now impose upon ship stations conditions which seem onerous to steamship companies, the penalty is not undeserved. Hereafter it must be impossible for even the president of a steamship line to absolutely throttle the voice of wireless. Imagine a city of 2,500 souls swept with sudden disaster, with 1,800 residents dead or dying, and the mayor of the town or the president of the telegraph company controlling the one telegraph wire and withholding all details for four days!

Since the above lines were written the Senate of the United States passed a bill, without discussion and without one dissenting vote, requiring two or more wireless operators on every vessel carrying 100 or more persons —crew or passengers—landing at our ports. One operator to be always on duty, night or day. Other countries will doubtless soon enforce the same requirement.

* * *

Auxiliary Wireless Power

AND while at-sea stations are being reorganized on a better basis, the question of auxiliary power to operate the wireless should not be overlooked. In the case in mind the electric plant was successfully operated up to the last moment. Had the ship swung on to the iceberg a second or two later than she did, the engine room instead of the forward compartments would have been flooded, immediately extinguishing all the lights and hushing the voice of the wireless. It may be recalled that this danger to the ship's station was commented on in these pages two years ago, at which time it was urged that an independent gas-engine power be provided on the upper deck in order to secure telegraphic communication to the very last instant. That this equipment will hereafter be secured seems likely, either by law, or voluntarily, as in the case of the "Megantic" now building.

* * *

World-Wide Wireless

WHILE on the subject of wireless it is interesting to note the progess being made to extend the inter-continental service. Our own government through the Navy Department is already constructing the longest chain of wireless stations in existence. This system will permit Washington to communicate with our own stations in Alaska, the Panama Canal Zone, San Francisco, Pearl Harbor, Hawaii; Tutuila Island, in the Samoas; and Guam, and Luzon, in the Philippine Islands. Each of these stations is to have a sending radius of at least 3,000 miles.

For commercial service the Marconi Company have planned a series of stations which will entirely encircle the globe; and the work of construction will be begun in the near future. An American steamship company has also announced its intention to proceed at once with the erection of three tower stations which will connect our Gulf coast with South America, thus furnishing communication with land stations there, for the first time. In a few years all the continents and the more important islands of the sea will be linked with an invisible network of communication. What a story of scientific and mechanical progress has been written from the days of the Spaniard Salva, who in 1795 dreamed of a submarine telegraph, to those of Morse in 1866, and now to the realization of a world-wide wireless system!

* * *

To Please the Public

A CERTAIN new depot, recently completed in Chicago, is a wonderful exemplification of painstaking study to provide the traveling public with every possible convenience. Roomy elevators toss the passengers swiftly from street to train floor, bureaus of information supply an endless fund of knowledge, electric lights on stairway landings prevent stumbling, and of course restaurants, telephones, telegraphs, cabs, drug store, news stands and the like are convenient and ample. Even the large space set apart for immigrant passengers traveling second class must appear like a palace to these people, with its white tiling everywhere, and rest rooms, restaurant, baths, laundry, hospital, and, in fact, no reasonable want unprovided.

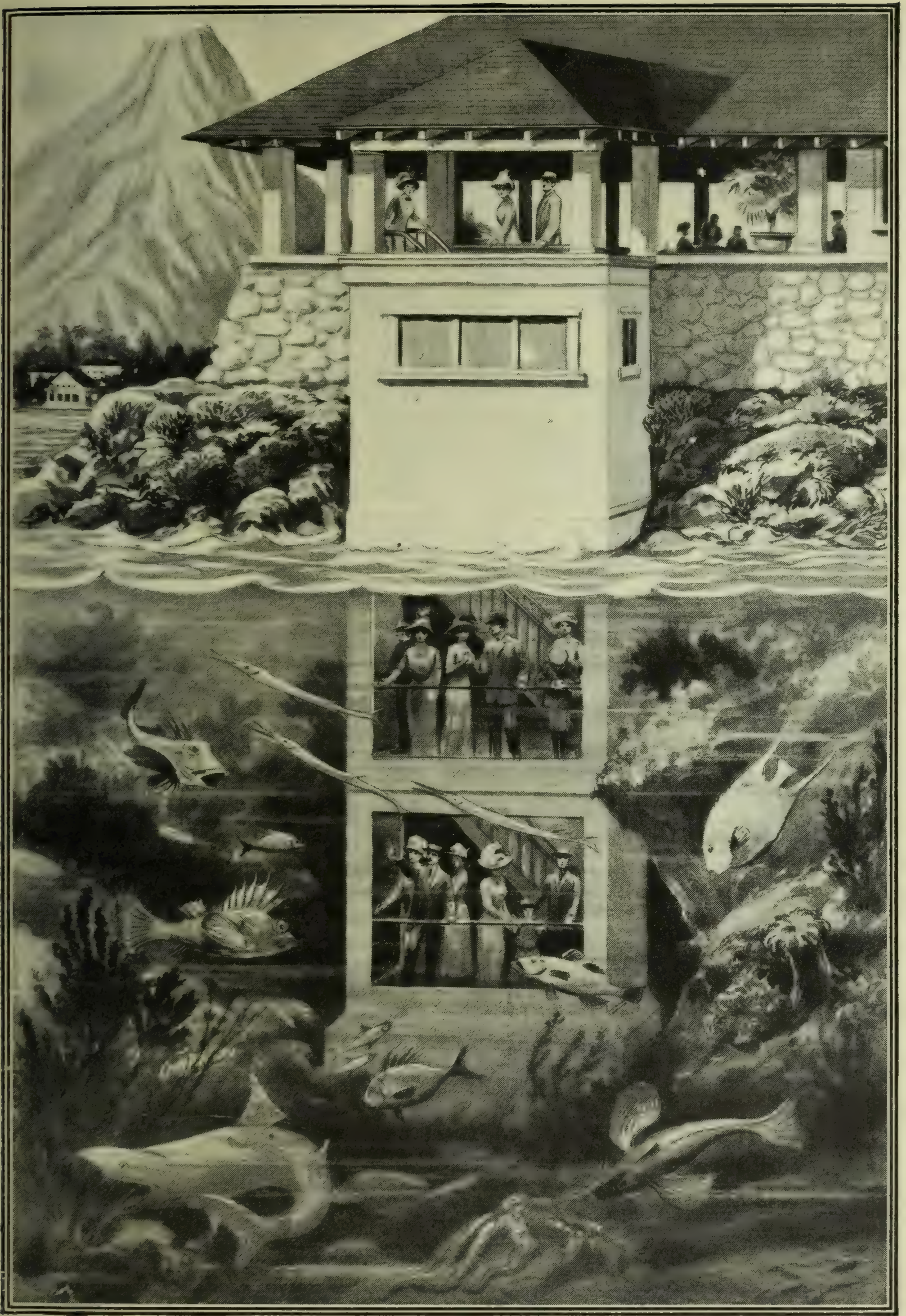
But the thing which most impressed me was not the magnificence of the building which cost a lot of millions, nor the beautiful marble, nor the high arched waiting room. It was a plain mahogany box, fastened to the wall where everyone who goes in or out can see it. And on this box are the significant words:

"TO PLEASE THE PUBLIC
Drop your suggestions in this box."

Having supplied everything that the best engineers and builders in America and Europe could suggest, or money can buy, there is provided this simple, dignified invitation to its millions of travelers each year, this last word of invitation to suggest some improvement unthought of by its own officers and employes.

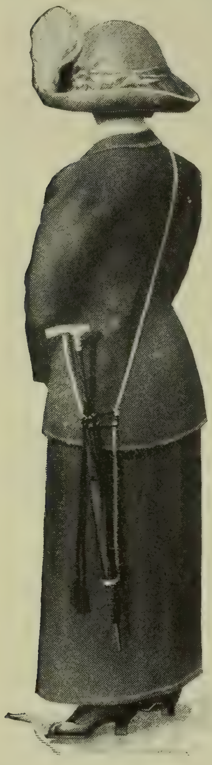
What a contrast the little mahogany box of today offers to the expressed policy of the greatest railroad owner of 40 years ago, who said, "The Public be——" Well, you know what.

H. H. WINDSOR



Business men of Honolulu, Hawaii, are preparing to build a modern hotel on the reef off Diamond Head, where the naval station is located. The most interesting feature of the hotel will be a glass-walled shaft which will extend down into the sea, allowing the guests to descend and observe the wonderful sea life in that locality.

AN UMBRELLA CARRIER



An ingenious carrier for unbrellas and parasols, designed to prevent the loss of this often forgotten article, has been invented by an English woman. It is a hanger made of cord designed to be passed around one shoulder, and the umbrella or parasol is hung from it in somewhat the same manner as a sword.

A RESOURCEFUL "ENGINEER"

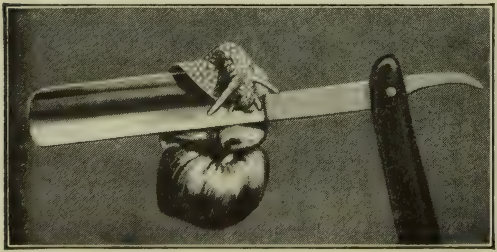
The following story has been taken from Electrical Engineering, and is said to have been sent by a correspondent in Australia: There is a little town of 2,000 people, away back in the bush of New South Wales, which can boast of an antiquated electric-light station, under the charge of a "chief electrical engineer," appointed by the aldermen of the district, and simultaneously performing the duties of stoker, wireman, and engine driver. He is also the leading and only electrical contractor in the town, and for some years past has reaped a very handsome income by selling metal-filament lamps to the farmers and other consumers at about 6s. each.

It happened not long ago that one of the farmers came to town, and was very much struck at the ridiculously low price for which he could obtain metal-filament lamps in the city, and on his advice the enterprising concern from which he obtained his lamps sent a traveler up to his town, and, in the absence of the previously mentioned "chief electrical engineer," disposed of some few hundred lamps at the ordinary selling price.

When our friend returned to his official duties, he realized that the sale of his expensive lamps had been considerably handicapped. But he was previously a marine engineer, and we all know that marine engineers are not to be easily cornered. The same evening, therefore, he thought it advisable to boost up his voltage, until every lamp in the town popped off. The next morning he took a push cart around town heavily laden with his own lamps, and told the poor farmers that if they would speculate on these inferior cheap German lamps they would have to stand the consequences.

SNAIL WALKS SAFELY OVER RAZOR'S EDGE

That snails can pass over such sharp implements as a razor's edge without the slightest harm has been demonstrated by a French scientist in the course of his study of these creatures, which are so well equipped for travel that they can move over surfaces exceptionally dangerous to seemingly better protected animals.

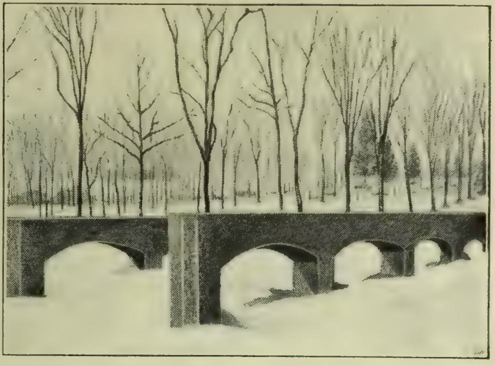


A Snail Crawling Over the Sharp Edge of a Razor Without Cutting Itself

The snail walks with the whole under surface of its body, and is provided with means to lubricate the road on which it travels. A peculiarly complex system of muscles enables it to cling in any position to the smoothest objects. In lifting itself over the razor's edge it clings with the hind part of its walking surface to one side of the blade, and extends the fore part and bends it down onto the other side without touching the edge, thus accomplishing without harm what would naturally seem impossible.

CONCRETE ARCHES FORM BASE FOR TOMBSTONES

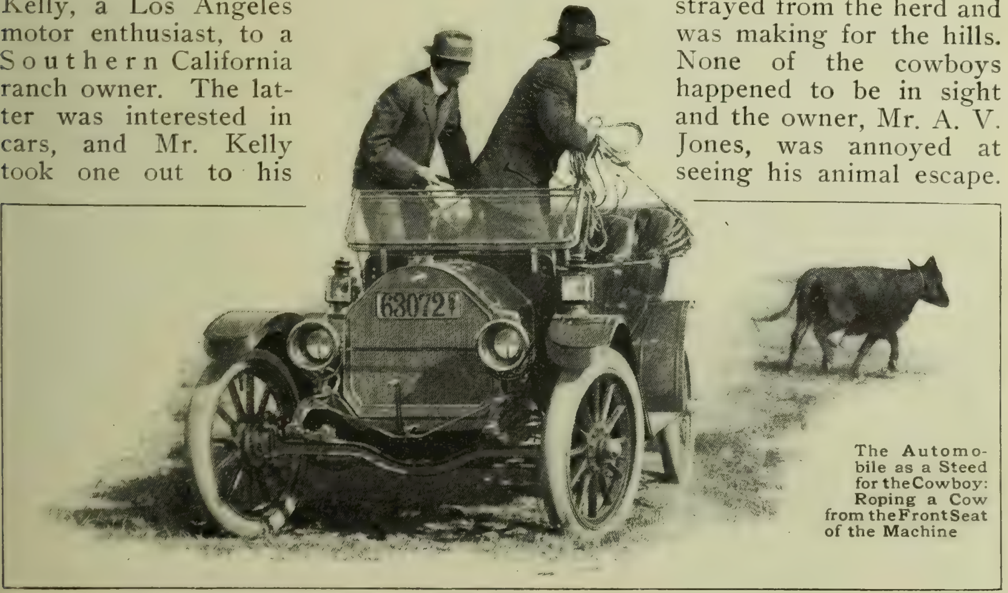
An unusual and interesting application of concrete has been adopted in the old cemetery at Portsmouth, N. H., to make a marshy section of ground available for graves. A section of the eastern edge of the cemetery, which is not far from a salt marsh that stretches in from the sea, was recently purchased by the trustees of the Home for the Aged. This land had long been considered too low and wet for burial purposes, but the trustees made it available by sinking concrete columns to bedrock and resting concrete arches upon them, there being nine rows, and nine arches to each row. At the lowest point of the slope the arches rose to a height of 6 ft. above the surface, requiring a considerable earth fill to raise the ground level to a height of 6 in. above the rows of arches. The arches will be used as foundations upon which the gravestones will rest as needed, and it is calculated that the foundations so constructed are of sufficient depth and weight to withstand upheaval by the frost.



Rows of Concrete Arches Erected in Low Ground of an Old Cemetery at Portsmouth, N. H., as Gravestone Foundations

THE MOTOR CAR AS A COW PONY

Probably the most remarkable demonstration of an automobile to a prospective purchaser of the machine was made by Gordon Kelly, a Los Angeles motor enthusiast, to a Southern California ranch owner. The latter was interested in cars, and Mr. Kelly took one out to his ranch to show what it could do. While driving it over the land, the rancher suddenly noticed that one of his half-wild cows had strayed from the herd and was making for the hills. None of the cowboys happened to be in sight and the owner, Mr. A. V. Jones, was annoyed at seeing his animal escape.



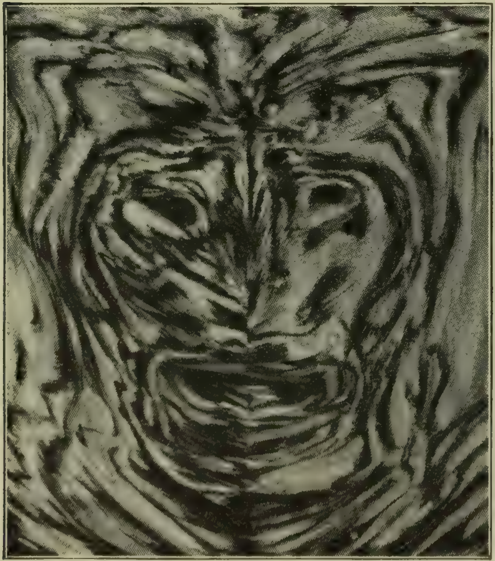
The Automobile as a Steed for the Cowboy: Roping a Cow from the Front Seat of the Machine

The motor salesman was equal to the emergency. "I will help you get that cow," he said, "if you will handle the rope." As Jones was a lariat expert, and happened to have a coil of rope in the car, he agreed. The automobile was speeded up and bumped over the rough ground at a pace too great for any wild cow. The animal was overtaken, and Jones whirled his noose in true cowboy style, catching the creature by the neck. Mr. Kelly, at the wheel, did his part like a veteran cowpuncher and brought the car around at the proper moment to throw the animal, which, once subdued, returned quietly to the herd.

Naturally the rancher was delighted at this exhibition of the car's adaptability to ranch life, and promptly made out his check, thus becoming the owner of the first "gasoline broncho" on record.

TIGER'S HEAD OUTLINED IN CIRCASSIAN WALNUT

A piece of Circassian walnut veneer, the natural markings of which showed one-half of a tiger's head, was recently discovered in a New York veneer plant. A long search was made to find the duplicate, but only a near duplicate of the perfectly symmetrical veneer could be found. The two pieces were mounted as shown and placed in a window. It has attracted much attention as a freak of nature, and an offer was made for it by a man who intended presenting it to Tammany Hall.



A Tiger's Head in the Natural Markings of Circassian Walnut Veneer

NEW TYPE OF BLOCK SIGNAL FOR COLD WEATHER

During last winter the various railroads experienced considerable difficulty in operating their block signals with any degree of accuracy, on account of the accumulations of ice and frost on the signal lamps. An interurban electric railway company, operating in northern Ohio, claims to have overcome the difficulty and solved the problem of operating block systems in cold weather by the use of a new type of signal.

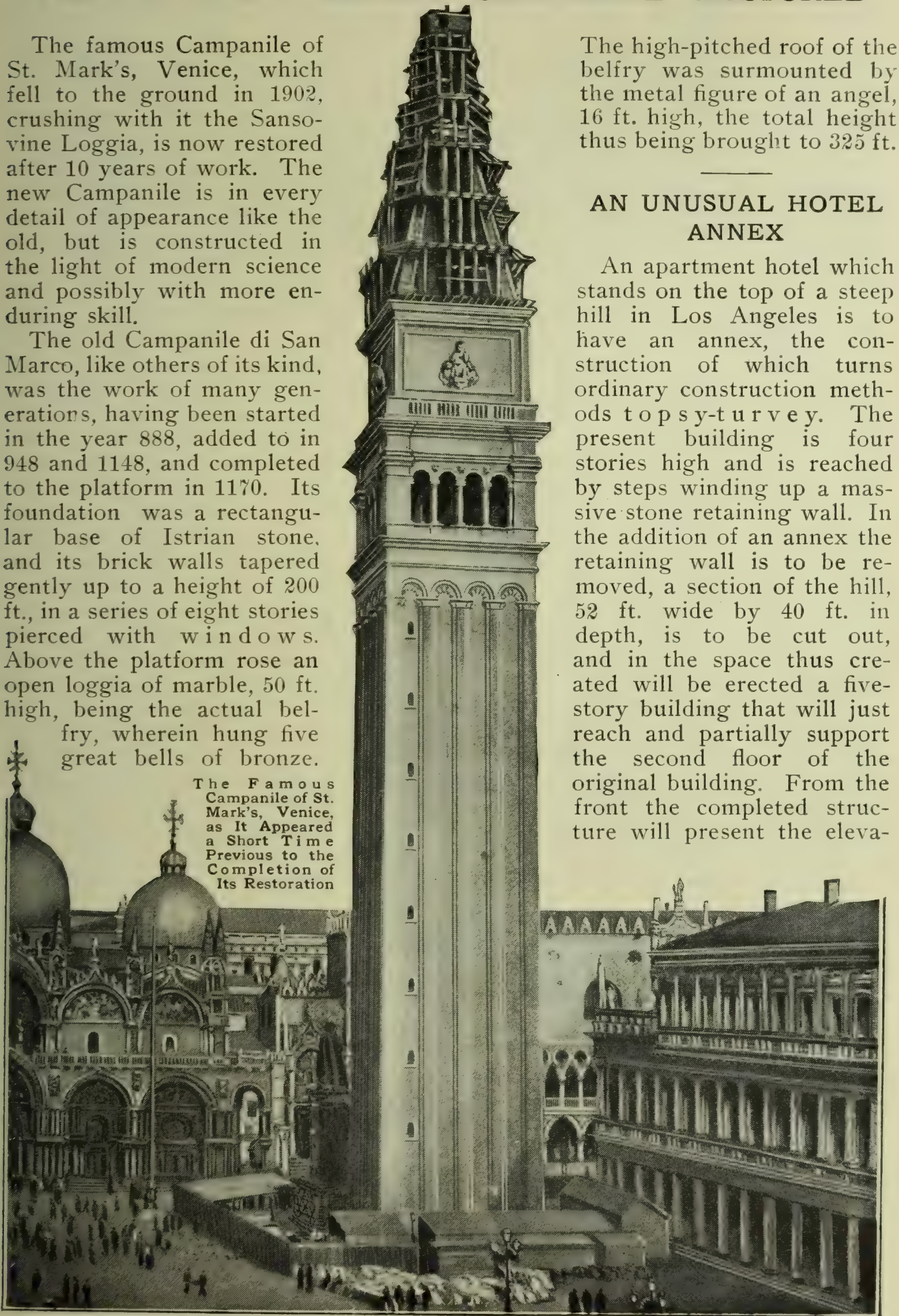
This new signal is arranged to be lighted by a 25-watt tungsten lamp, which in this particular case was supplied with electrical energy from the trolley wire, a suitable resistance being connected in series with it. The switch-controlling mechanism is operated by a small motor, which also derives its energy from the trolley wire, and is so designed that it will operate safely through a wide variation of line pressures. The heat generated in the lamp and the resistance in series with it, are ample to prevent the accumulation of ice on the lenses of the lamp and the switch-operating mechanism. Of course, in the case of a steam road, it would be necessary to install batteries of considerable capacity at different points along the road to supply energy to the lamp; and to provide sufficient resistance to bring about the desired results.

¶According to the law, as decided by the courts, an oil company can post a location notice on a tombstone in California, and sink an oil well within 20 ft. of the graves, even though the land be held under a federal patent.

FAMOUS SAINT MARK'S CAMPANILE RESTORED

The famous Campanile of St. Mark's, Venice, which fell to the ground in 1902, crushing with it the Sansovine Loggia, is now restored after 10 years of work. The new Campanile is in every detail of appearance like the old, but is constructed in the light of modern science and possibly with more enduring skill.

The old Campanile di San Marco, like others of its kind, was the work of many generations, having been started in the year 888, added to in 948 and 1148, and completed to the platform in 1170. Its foundation was a rectangular base of Istrian stone, and its brick walls tapered gently up to a height of 200 ft., in a series of eight stories pierced with windows. Above the platform rose an open loggia of marble, 50 ft. high, being the actual belfry, wherein hung five great bells of bronze. The high-pitched roof of the belfry was surmounted by the metal figure of an angel, 16 ft. high, the total height thus being brought to 325 ft.

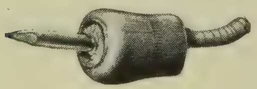


The Famous Campanile of St. Mark's, Venice, as It Appeared a Short Time Previous to the Completion of Its Restoration

AN UNUSUAL HOTEL ANNEX

An apartment hotel which stands on the top of a steep hill in Los Angeles is to have an annex, the construction of which turns ordinary construction methods topsy-turvey. The present building is four stories high and is reached by steps winding up a massive stone retaining wall. In the addition of an annex the retaining wall is to be removed, a section of the hill, 52 ft. wide by 40 ft. in depth, is to be cut out, and in the space thus created will be erected a five-story building that will just reach and partially support the second floor of the original building. From the front the completed structure will present the elevation of an eight-story building, with the upper stories set back some distance from the cornice level. The roof of the addition will constitute an open terrace in front of what will be the sixth story.

CURIOUS "FREAK" OF A BULLET



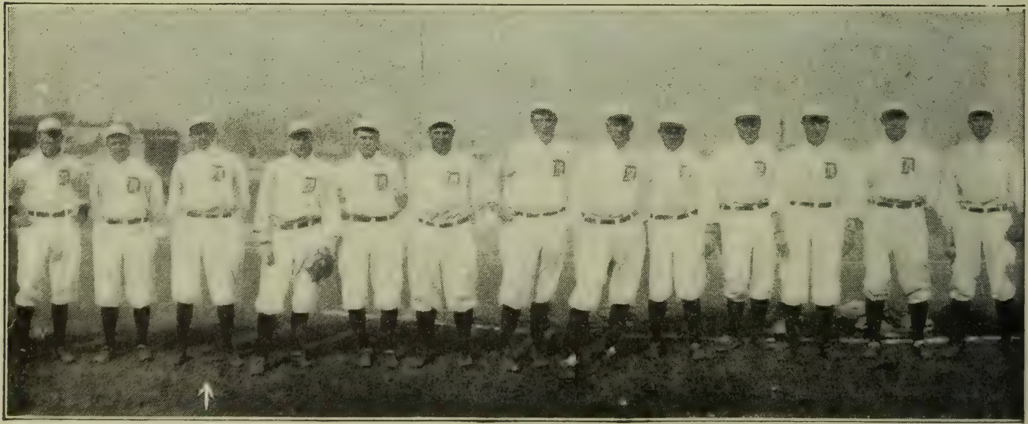
In shooting with a 38-caliber automatic revolver at a target made of a block of wood, 10 in. thick, the bull's-eye of which was a tin button, such as is used in fastening tarred paper roofing, one of the marksmen succeeded in hitting a shingle nail, which was used to fasten the button, almost exactly in the center. Upon splitting the block of wood to recover the bullets, it was found that the bullet which hit the bull's-eye had penetrated 8½ in. into the wood, and, in its course, had enveloped the shingle nail and taken it with it. The manner in which the bullet enveloped the nail is shown in the illustration.

WHOLE CITY TO BE HEATED BY ELECTRICITY

Plans are being formulated to heat electrically the dwellings and business houses of Stavanger, in Norway, and the officials of the electric plant at that place have applied to the city council for permission to carry out their proposed undertaking. The population of Stavanger is about 30,000 and there are ample water-power facilities available to develop at least 25,000 hp. for electrical purposes. As it is planned at present, no customer will be allowed a greater consumption than 100 hp., and owing to the exceedingly low cost of production, the price per horsepower for one year will be only about seven dollars. The city officials are also considering the advisability of heating the public buildings by means of electricity.

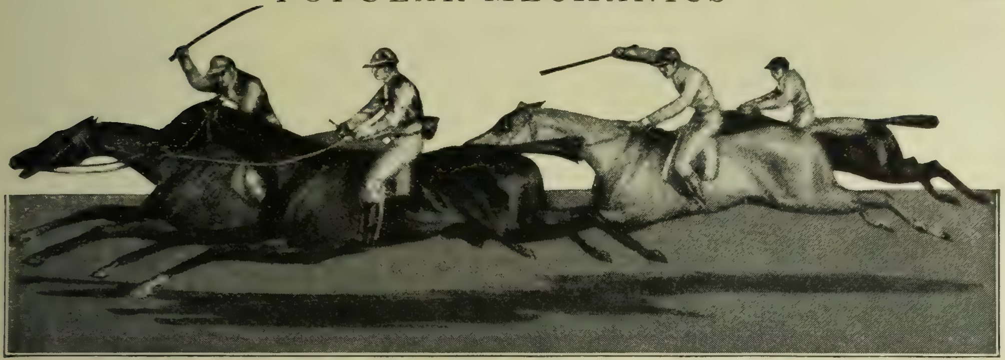
TY COBB TWICE; A UNIQUE PHOTOGRAPH

The photograph of the Detroit Tigers here reproduced has created much comment, in that Ty Cobb, considered one of the greatest, if not the greatest baseball player in the world today, appears twice. The way in which he succeeded in appearing twice, however, is a very simple matter. The camera used to take the picture was of the panorama type, which was made to revolve slowly from left to right, exposing but a small portion of the film at a time. Cobb stood third from the left end of the line of players shown in the illustration when the camera started and as soon as the lens had passed him he sprinted around back of the camera and was standing at the



Copyright, 1912, Daines & Co., Detroit

A Unique Photograph of the Detroit Baseball Team



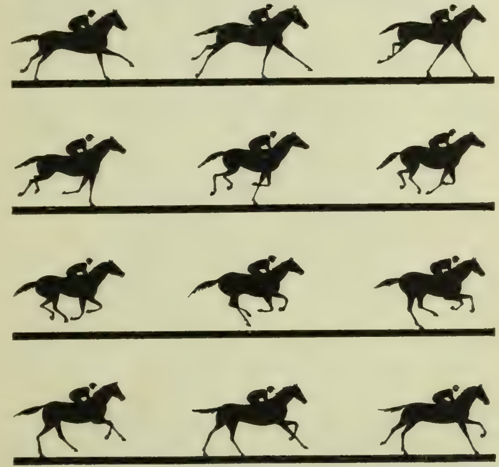
The Epsom Race; after a Painting by Géricault

right of the line before the camera reached the end of the picture.

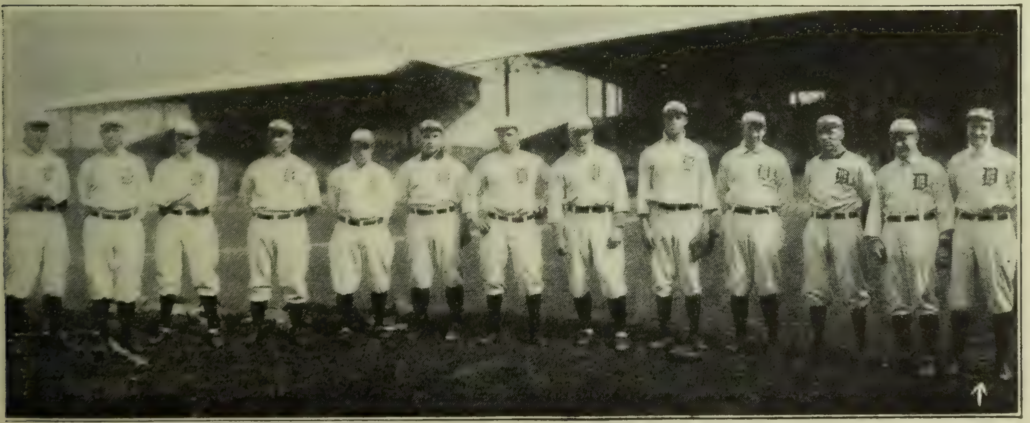
Some of the baseball fans surmise that he did not like the serious expression of his face when the camera first caught him and sprinted around to the other end to get his smile into the picture. Others remark that he is most of the team anyway and in full justice might have been taken four or five times instead of only twice.

MOTION IN ART AND IN REALITY

How far the means of visualizing swift motion usually adopted by painters differs from the actual performance in reality is well demonstrated in the accompanying illustrations. One of these is from a painting of the Epsom Race, one of the famous annual racing classics of England, painted by Géricault. It cannot be denied that this painting conveys an impression of speed, yet there is not one attitude of the horse as shown by the motion pictures that is anywhere near like that of any of the horses in the painting.



Motion Picture of a Galloping Horse

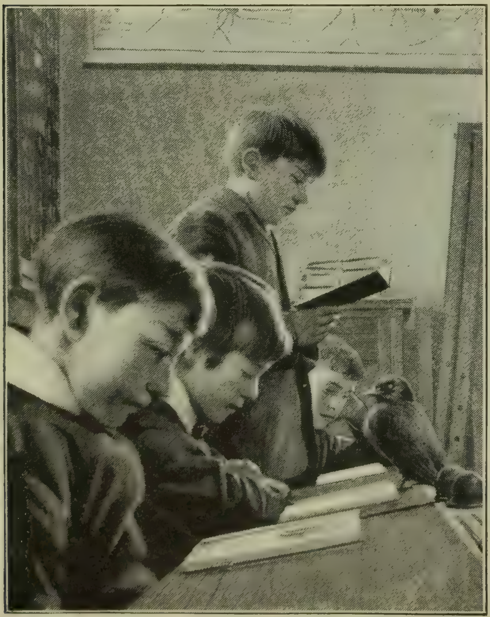


in Which Ty Cobb Makes His Appearance Twice

A JACKDAW THAT GOES TO SCHOOL

An unusual companionship between a small boy and a jackdaw exists in the village of Upton, Berkshire, Eng. The boy is Joseph Butler, aged 12, and the jackdaw, which is now two years old, and which was found by him after falling from its nest while young, is never satisfied to let him out of sight. The bird is so fond of the boy that it goes to school and to church with him, pecks other boys who fight him, sits by him at meals, and sets up a mournful cawing when kept away from him. For over a year now the bird has gone to school with its young master, sitting quietly on his desk. The teacher allows the bird in the school, since, if she kept it out, its caws as it fluttered around the schoolhouse would disturb the other children.

The Jackdaw in His Master's Arms


Perched on the Desk and Looking Wise While His Master Recites

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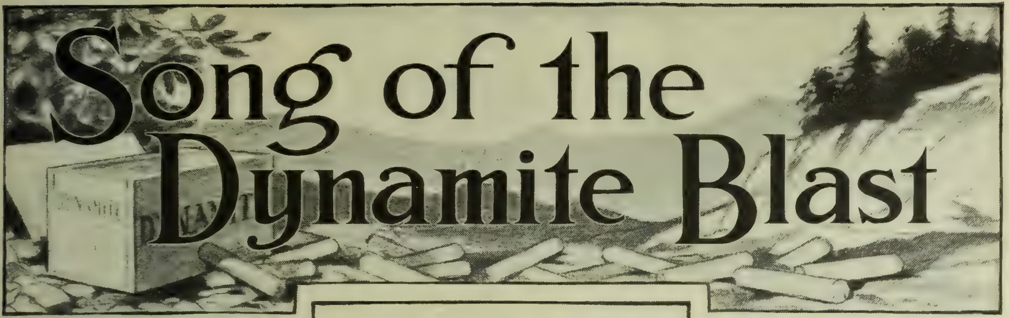
NETTLE A SUBSTITUTE FOR COTTON

In the last few years a great many experiments have been made on various materials in an effort to find a suitable substitute for cotton. The most promising plant, on account of the strength of its fiber and its ready growth under very adverse conditions together with its large yield per acre, is the common nettle, and by a recently invented method of treatment which seems to have solved the problem, it now gives us a fair substitute for cotton in many of its uses.

In the new treatment the dried nettle stems are first boiled for a short time in dilute soda lye, which loosens the fibers from the woody stems. The fibers are then separated from the woody portions by means of brushes in a special machine and subjected alternately to boilings in dilute lye and thorough washings. The resulting product is a yellowish mass of fine fibers, which are entirely free from gum and may be bleached, combed and spun into yarn. This yarn is claimed to have the smoothness and softness of flax, and a strength greater than that of hemp; may be woven into damask, or used, alone or in combination with other threads, in making ribbons, upholsteries, and numerous other fabrics.



Song of the Dynamite Blast

By J. W. FOLEY

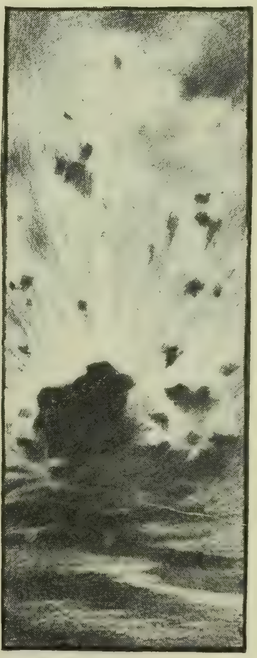
I SLEEP, and I am still as death,
    Inert and hurtless as a stone.
I wake, and in my flaming breath
    Are rock-bound temples overthrown.
Caress me, and I lie as still
    As when the adder slumbers deep;
But strike me, and I rise to kill
    Who wakes me from my torpid sleep.

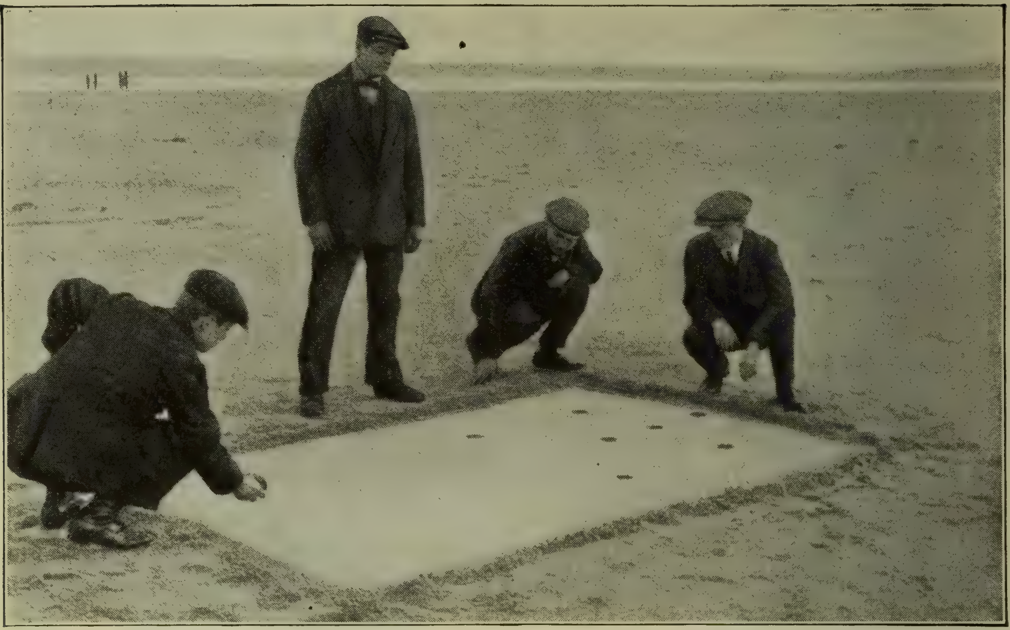
Asleep, I have no voice or will,
    But strength that lies in me unspent.
Awake, I rend and maim and kill
    Who may not fly. By me were rent
Those granite rocks, that long defied
    The puny strength of man to mar,
I spake, and they were brushed aside
    Like leaves, and split as faggots are.

From out my wakened throat a roar;
    From opened eyes my flame-shot glare;
My arms hurl thunderbolts that score
    The steel, and toss them high in air,
Those great, gray rocks, like pebbles flung
    From slings; I crush them at my will,
And with a demon's angry tongue
    Exult my ruin—and am still!

My putty-mass is soft and sleek
    As is the drowsy tiger's paw;
But rouse me, and red scars I wreak
    When I unsheathe my hidden claw;
I cleave the granite, twist the steel,
    And lay the temple in debris;
I crush the rib and smash the keel,
    For ruin hides, but bides in me.

Bind me with manacles of steel,
    House me in narrow walls of stone;
Gird me with granite thongs, and feel
    My sinews quiver: and the bone
And brawn of me in fury lay
    In wreck what prison walls may be.
I smite, I strike, I split, I slay—
    And I am—as I would be—free!

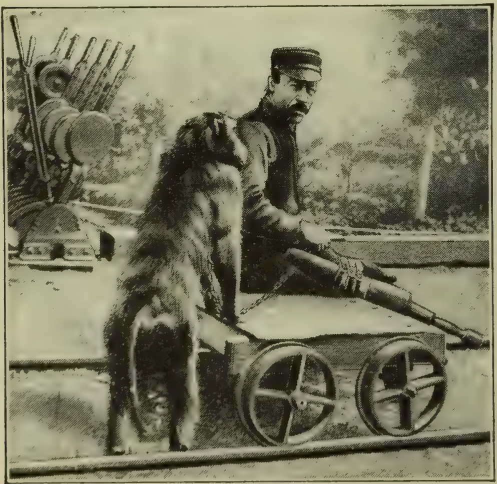




Young English Miners Playing Sand Billiards During the Recent Strike

RAILWAY SIGNAL MAN HAS BABOON ASSISTANT

Through an accident on the Transvaal Railway this man lost the lower part of both his legs, and when he recovered was given a position as signalman. In order to assist him in getting about on his truck he trained a young baboon, who faithfully pushes the truck along.



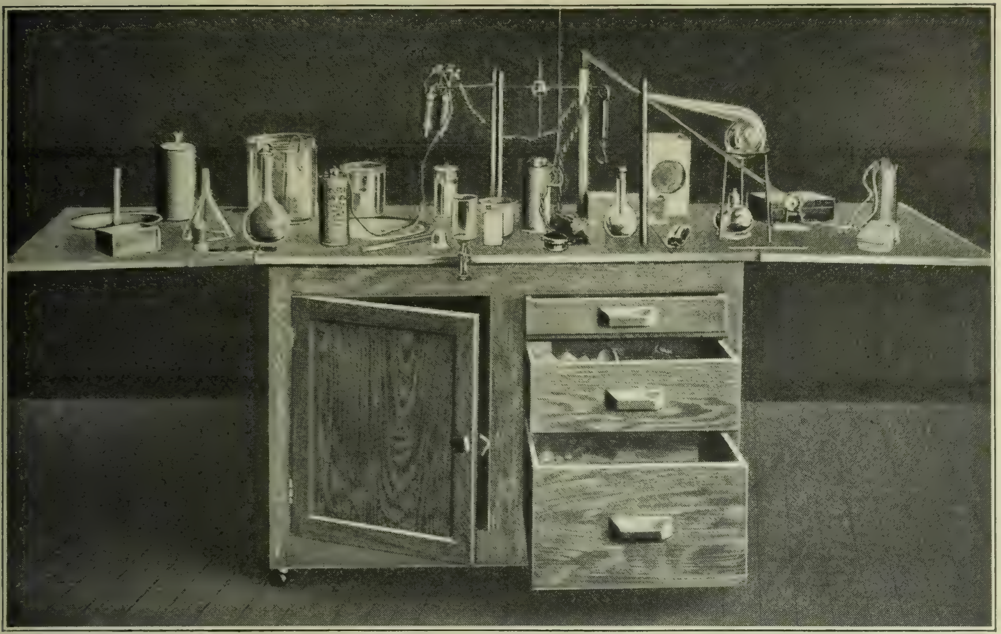
A Crippled Signalman on the Transvaal Railway and His Baboon Assistant

NEW GAME FOR THE SEASHORE

During the coal strike in England a number of young South Shields miners, seeking new ways of amusing themselves, invented a new game, or, at least, adapted an old one to new conditions. They leveled off a portion of the sand to represent a table and gouged out six or seven cups or holes at one end, each hole having a different value, according to its size. The object of the game is to roll the ball into one of the holes. They called the game sand billiards.

STUDENTS CONSTRUCT OUTFIT FOR EXPERIMENTATION

When the board of school directors of Antis township, Pa., failed to realize the importance of experimental work in agriculture and physics in the high school, because the equipment was too costly, Prof. J. L. Zerbe relied upon the ability and resources of his students. The students were eager to assist. The boys, at recess and noon periods, worked faithfully for two months in the cellar making models,

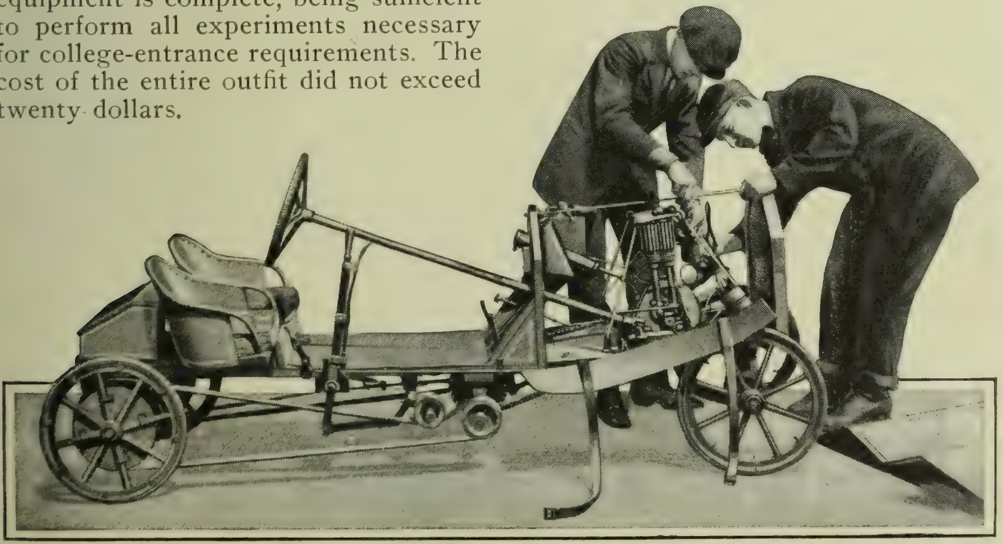


Experimental Apparatus and Case Made by Students When School Authorities Declined to Purchase Outfit

other equipment, and a case for the experimental apparatus, while the girls prepared the delicate parts and did most of the intricate mounting. The case, when open, has a working space of 30 by 88 in. It contains a sink connected with a reservoir from which the water is raised by a force pump. The equipment is complete, being sufficient to perform all experiments necessary for college-entrance requirements. The cost of the entire outfit did not exceed twenty dollars.

A "PUSHMOBILE" AUTOMOBILE

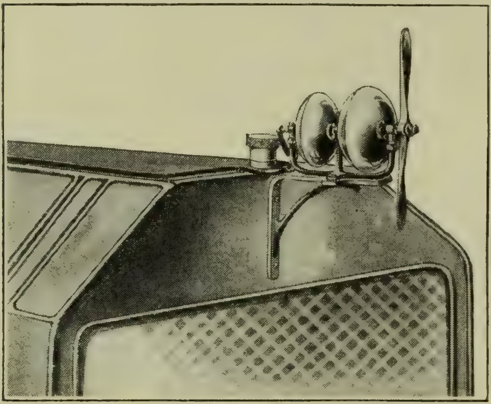
Two Philadelphia boys have combined a motorcycle engine with a "pushmobile" wagon and made preparations for an endurance run to Atlantic City. The illustration shows the little machine in detail. The own-



An Interesting Little Motorcycle-Engined Automobile Built by Two Philadelphia Boys ers claim a speed of 18 miles an hour without much effort on the part of the little motor. The machine is started with a push. One boy sets it going, jumps in, and away they go.

AIR-PROPELLER ALARM FOR AUTOMOBILES

An ingenious propeller-driven alarm bell for automobiles has made its appearance in Paris. The shaft on which the propeller is mounted passes through the bells and has hammers mounted upon it in such manner as to keep striking as the shaft revolves. The outfit is mounted on an automobile so that, when the chauffeur operates the mechanism which releases the shaft, the propeller is whirled by the resistance it offers to the rush of air. The propeller whirls and the bell rings until the chauffeur operates the mechanism locking the shaft again.

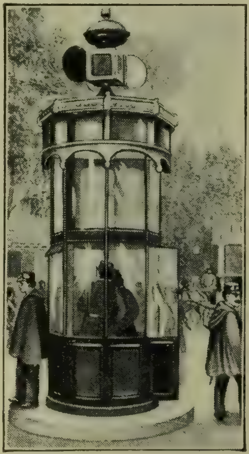

An Automobile Alarm Bell Rung by an Aerial Propeller Driven by the Resistance It Offers to the Rush of Air Against a Running Car

TAXICAB TELEPHONE SYSTEM

In a great many cases, livery companies are unable to use their conveyances to the best advantage, owing to the fact that it is impossible to communicate with the drivers after they have started out with a fare. It quite frequently happens that a driver is sent to some remote part of the city with a fare and then must return empty, while another driver may be sent to a neighboring section for a fare, and must go out empty. If, however, some means were provided for communicating with the first driver he might not need to return empty, nor would, perhaps, the second driver have to leave the station. This would result in a considerable saving in what is now known as "dead" mileage. For this reason a Pittsburg taxicab company is installing a telephone system, with telephone boxes placed at various points throughout the city, so that the driver of the taxicab may communicate with the company's central office before returning, in order to ascertain whether another fare may be picked up on the way back, thus eliminating the necessity of sending a second machine to the same neighborhood.

STREET-CROSSING KIOSKS FOR POLICEMEN

Street traffic in Paris has been controlled by policemen placed at crossings and provided with whistles, as has become the custom in several of the largest cities in America, but a new signaling system is now being tried out which makes use of an ornamental kiosk, the roof of which is equipped with signal boards. These kiosks, which are placed at the crossings, are glass-covered, and the policeman takes his stand on an elevation inside the structure, from which he has an unobstructed view of the traffic ways. Above the roof, mounted on a shaft, is a cube-shaped, box-like affair, painted white, which is provided with two wing-like extensions. The shaft is turned by a wheel inside the kiosk, and the direction in which the wings face indicates to traffic whether to stop or proceed.



STATE COLLEGE HAS POULTRY HOSPITAL

The Rhode Island Experiment Station has established, at the poultry department of the Rhode Island State College, the most unusual institution for the treatment of the diseases of poultry yet established. It is called the poultry "hospital" and owes its name to the fact that it is primarily an institution for the curing of poultry diseases, just as much as our own hospitals are for the advancement of science in curing the human ailments. This hospital consists of a house of modest appearance, where the patients are treated, and an extensive caged area where the patients may be turned out for exercise and sunshine. This provides for observation of the diseased inmates of the institution, as nearly under normal conditions as possible.

The Poultry "Hospital" at the Rhode Island Experiment Station

On Left—The Operating Room

The hospital building is a small one-story building and would scarcely attract the attention any more than the other buildings of the poultry plant. Yet, it is most interesting in the uses to which it is put. It is divided into four rooms, an office, a laboratory, an operating room, and a "patients' ward," or sanitary-pen room. In the office the head of the biological department of the experiment station, Dr. Philip B. Hadley, conducts the work of the institution. Here the data of the diseased patients are compiled together with the results which may be valuable in combating the diseases investigated. The

The Sanitary-Pen Room of the Poultry Hospital laboratory is equipped with various kinds of apparatus for the bacteriological investigations, and here is where all the cultures of the diseases investigated are kept and experimented with. Of course, it must be taken into consideration that the work of the institution is more for the prevention and cure of diseases than for the cure of the individual fowls afflicted. Yet the out-of-town patients are rather numerous, for feathered patients are often sent to the hospital to have their ailments diagnosed. In this way the institution is of great value to the state and aids in the suppression of poultry diseases, which would otherwise greatly handicap this most important New England industry. Besides the usual equipment the laboratory is provided with sterilizers, and workbenches offering facilities which are usually found only in the best bacteriological workrooms. The operating room is painted in white enamel and is well lighted for any operations on or inoculations of the feathered patients. As in institutions for humans, most of the furnishings are finished in enamel, and the operating tables are glass or porcelain-topped in order to minimize the possibility of infection. A special apparatus has been devised to hold the fowls during the operations, and as anesthetics are used, the patients suffer little or no pain. The instruments are kept in a glass case and as carefully sterilized as in the best city hospitals, and during operations the attendants are obliged to wear the same sanitary cloak and observe the same precautions as required in hospitals for human beings.

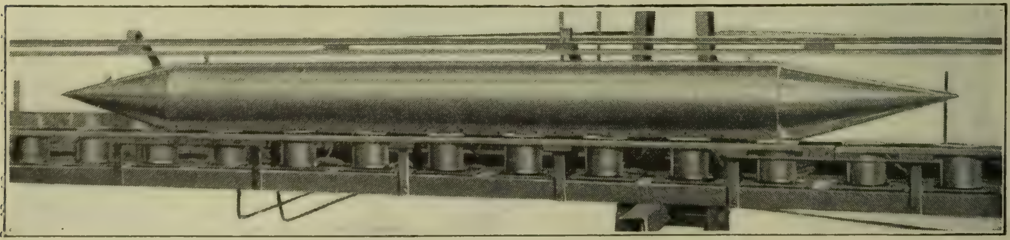
In that department which might be called the "ward room," are a number of sanitary pens where patients may be kept. This room is finished in concrete and has a concrete floor, making it as nearly antiseptic as possible. Here suspected or innocuous patients are kept while being investigated for different diseases.

It is believed that much good may accrue from the investigations conducted by this addition to the station, which is at present the only one of its kind in the United States, if not in the world. The department is at present devoting its efforts to the discovery of means by which cholera among poultry may be prevented or cured.

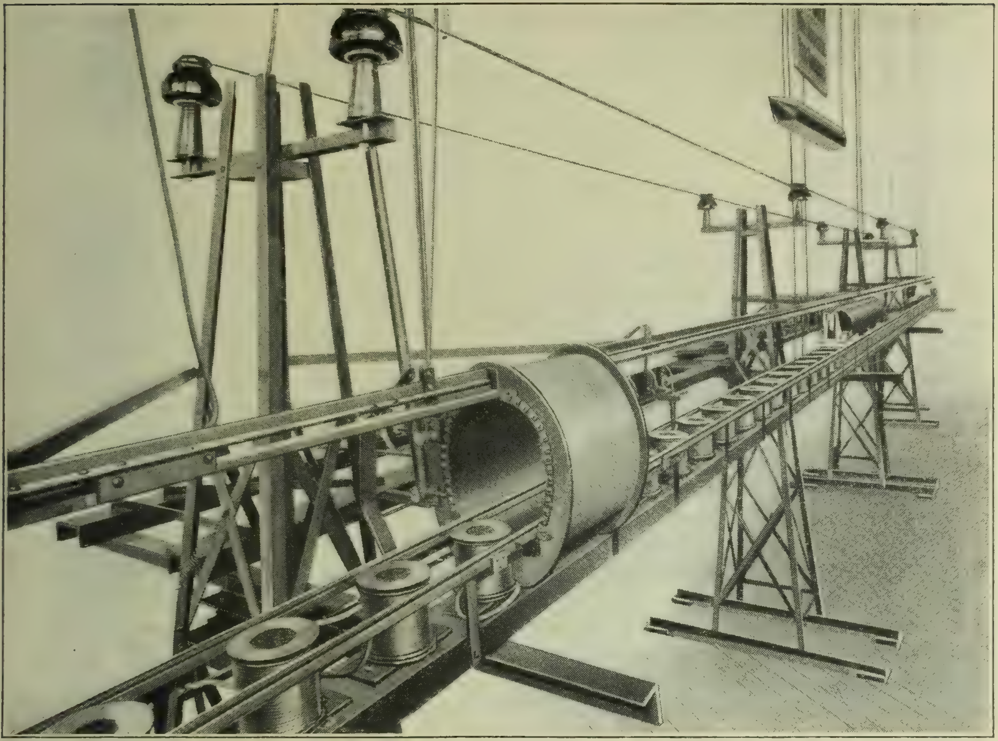
RAILWAY ON WHICH CARS FLOAT ABOVE RAILS

Passenger coaches that float above and between guide rails, with nothing touching except the brushes that control the electrical current, is the dream of a Franco-American inventor of Mount Vernon, New York, who has succeeded in obtaining results with a model apparatus.

In this apparatus, the Foucault or eddy currents induced in a piece of metal placed in an alternating magnetic field are utilized to sustain, or, in other words, to make the car float between the guide rails. At frequent intervals upon the model roadbed are placed large electromagnets, so arranged that an alternating current may be passed through them. Only those magnets that are adjacent to the car are energized, the current being controlled by brushes attached to the car and making connection by touching the



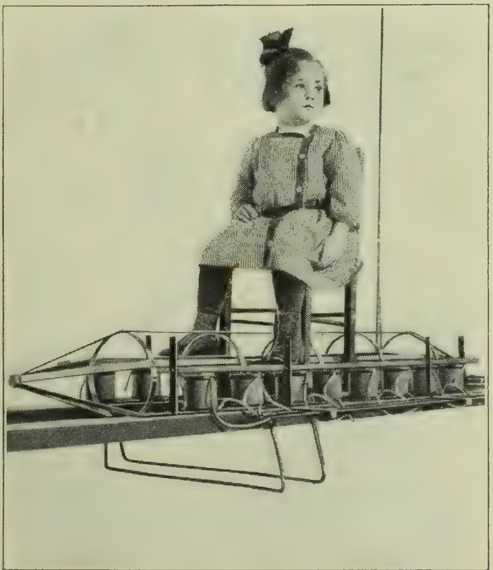
One of the Cylindrical Model Cars in Position over the Electromagnets



The Roadway, Showing the Single Line of Electromagnets Directly Above Which the Car Floats and is Drawn Along, and One of the Propelling Solenoids

guide rails. In addition to making the electric connection these brushes also serve as guides to keep the car directly over the electromagnets.

Two model roads have been constructed, one of which has the electromagnets in a line directly in the center of the roadbed, while the other has two rows, running parallel, above and between which the car is sustained. With the first-mentioned type of roadway the large aluminum plate which plays such an important part in the unique invention forms the base of the car, while in the second type the car is provided with two aluminum plates, arranged one on each side of the car, so that each line of electromagnets will have a plate directly above it. When the electromagnets are energized by an alternating current, the aluminum plate, or plates, are in a strong alternating magnetic field, which results in eddy currents being induced in the plate. These eddy currents react upon the magnetic field and produce the



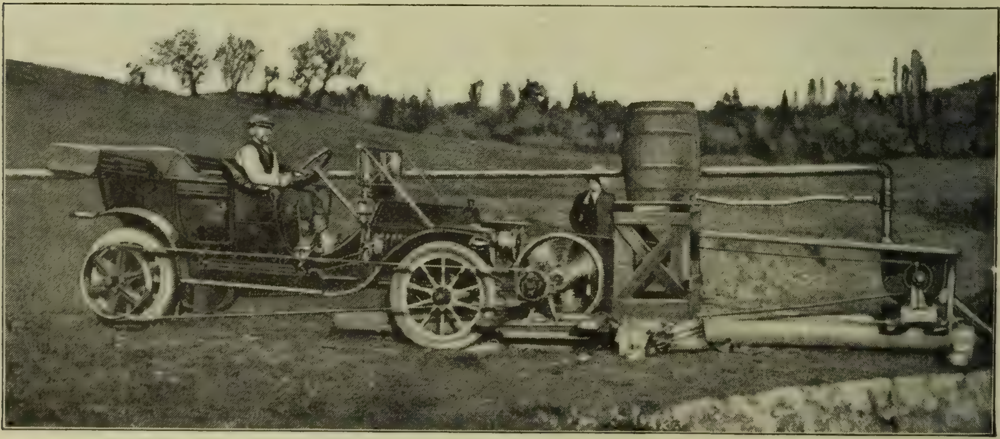
This Illustration Shows the Type in Which a Double Row of Electromagnets is Utilized. The Child is Seated in a Chair Placed on an 18-Foot Model Car, the Whole Being Suspended in the Air by the Action of the Electromagnets. Notice Space between the Tops of the Electromagnets and the Aluminum Plates force tending to raise and float the car. In addition to the single or double line of electromagnets, solenoids are located at regular intervals, the purpose of which is to provide propulsion for the car. As the iron car approaches, these solenoids become energized and draw it toward them, and the instant the car reaches a neutral position within them, the magnetic effect is reversed, the succeeding solenoids in the line in turn exerting the attractive force.

The inventor of this scheme claims that enormous velocities may be attained as the only friction to overcome is that of the air and the little friction due to the brushes on the rails. He proposes to reduce the friction of the air by making the ends of the car body conical in shape and the main portion cylindrical and very smooth.

The device may appear to practically eliminate mechanical friction, but it is reduced at an enormous cost. The inventor claims he can lift a weight of about 12 lb. with one kilowatt of power. Neglecting the weight of the car and assuming there are 50 passengers in each car and each weighs 150 lb. we have a total of 7,500 lb. If one kilowatt will lift 12 lb., 625 kilowatts will be required to lift the above passenger load, which neglects the weight of the car, the propelling power required, etc. An electric locomotive that will develop about 2,000 hp. will haul a five-car passenger train up to a speed of at least 70 miles per hour. There would be 3,125 killowatts or about 4,000 hp. required to lift 250 passengers, or the power required to merely lift the passengers in five cars would be about twice the power required to haul the entire train on an ordinary electric road. The gain in speed seems to be the greatest advantage possessed by the new scheme, but it must be remembered that air friction is not overcome and that this varies as the square of the speed, so it soon becomes exceedingly large.

AUTOMOBILE PUMPS WATER

The owner of a ranch in California recently built a large storage reservoir for irrigation purposes, and adopted a novel scheme for pumping into it. He runs his automobile into position as shown in the illustration, and makes a belt connection with a rotary pump by means of a large band wheel attached to the driving axle outside one of the rear wheels. The statement is made that water is pumped at the rate of 250 gal. per minute by this arrangement. The storage reservoir will hold 500,000 gal.



An Automobile-Driven Rotary Pump Used to Fill an Irrigation Reservoir on a California Ranch

THE FIRST AMERICAN AERO SHOW

By JAMES R. QUIRK

THE United States may be lagging behind France, England, and Germany in number of aeroplanes in use, and, perhaps, in public interest in aviation, but the first American aeronautic show held recently at the Grand Central Palace, New York, furnished sufficient evidence that real progress in the art of aviation is being worked out in this country by American brains.

Responsibility for our position in the world of aeronautics cannot be placed upon the manufacturers for they but serve the public. Nor can it be blamed upon the public whose enthusiasm has apparently waned in the past year or so. It is but natural in this day of wonderfully fast development in the arts and sciences that the spectacle of man flight should, in a few years, become commonplace to such a degree that the public peers into the sky and views the maneuvers of an aeroplane with no more wonderment than that with which it gazes on an automobilist racing at high speed.

Blame has been placed upon the government for not encouraging aviation to the extent that some of the European countries do, but the gentlemen in Congress who hold the purse strings which even our War and Navy Departments cannot loosen, feel that there is no more reason for the United States joining in the European aviation competition than that we should compete with them in the size of the standing armies.

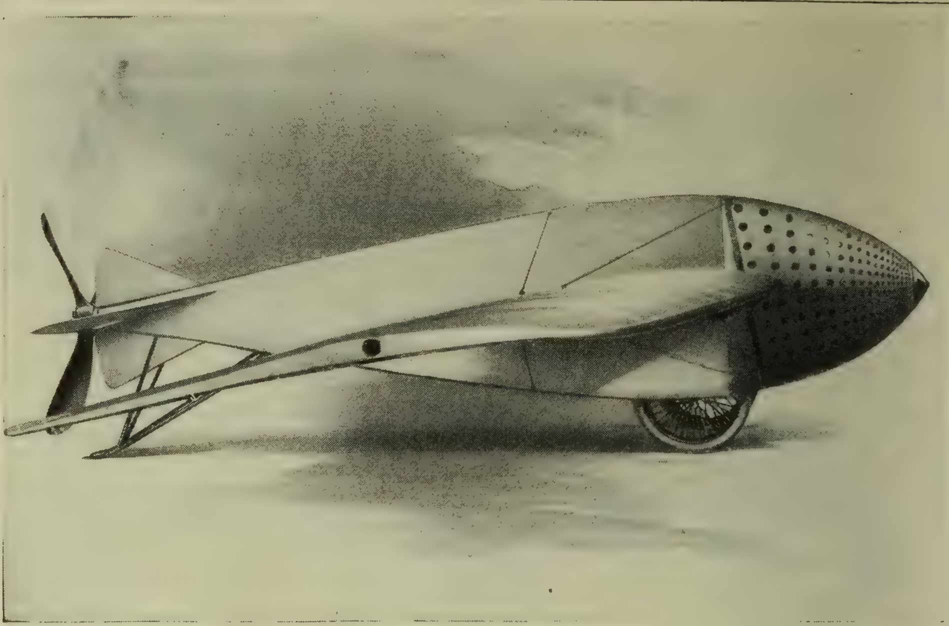
Sound construction and scientific design, based upon investigation and experience marked the majority of the machines at the American show, and there were but a few of the class which can be termed "freaks." This is an encouraging sign. The day has passed when an inventor can, with any hope of success, impose upon the credulity of the public in announcements of a discovery which will "revolutionize the art of aviation."

One of the important features of this show, as in the recent London and Paris exhibits, was the increasing realization of the importance of the streamline form in the design of wings and body. A monoplane, designed and constructed by Edson Gallaudet, utilizes, probably to a greater extent than any other machine ever built, the advantages of this new theory. Many fine flights have already been made with it. Nieuport, whose recent untimely death was a blow to aviation, was one of the first designers to incorporate this theory in the design of his machines, and his monoplanes still hold world's records for speed. It is obvious that a realization of the great advantage of making the air pay back some of the force used in overcoming head resistance is having a potent influence.

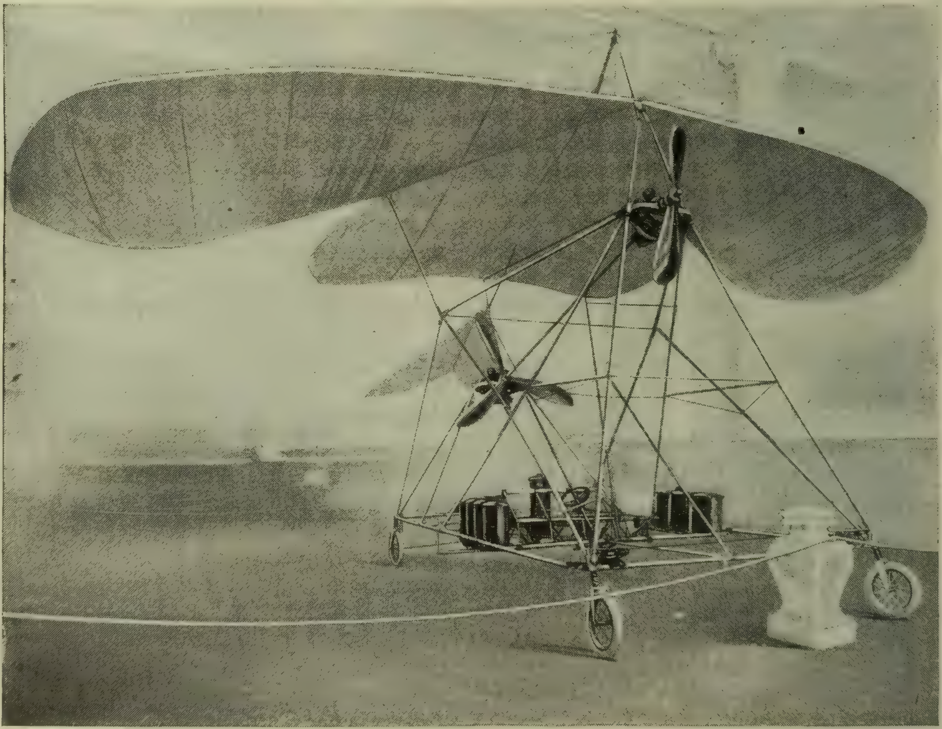
Refinement of detail and increasing strength of structure are the only changes visible in the Wright and Curtiss machines. Reference to the illustration of the 1912 Wright biplane will show small, rectangular vertical planes on the front. This is one of the results of the classic Kitty Hawk experiments of last year.

The advent of the hydro-aeroplane, for which America can claim a large share of credit, is, in the opinion of many builders, a thing that may cause aviation to be taken up as a sport much sooner than it otherwise would, and the number of the combination water-and-air craft, was one of the most interesting features of the Central Palace Exhibit. A most interesting design is that credited to Grover C. Loening, a veritable winged boat.

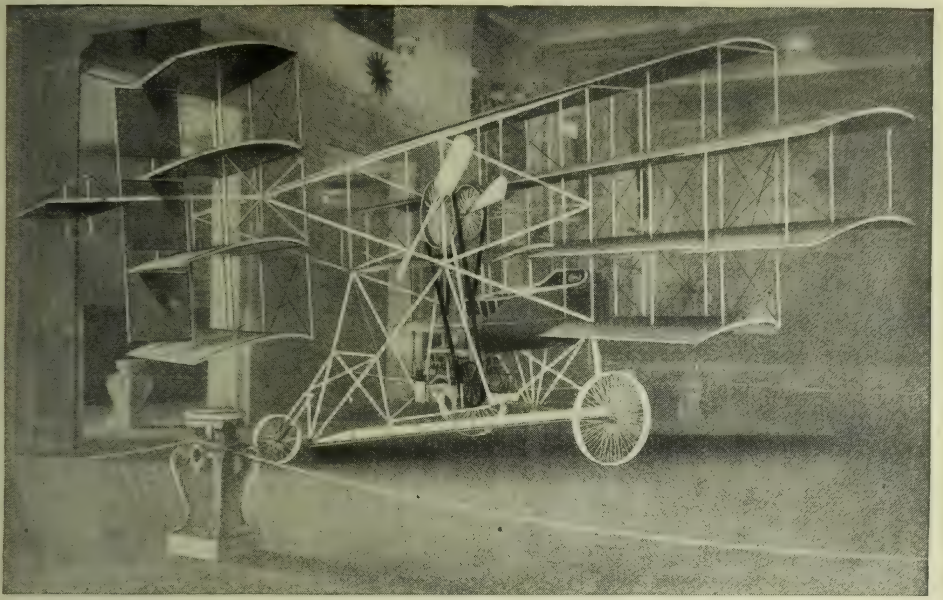
The New York show demonstrated the extent to which the aeroplane has developed as a commercial factor. In addition to the scores of firms which have been organized for the purpose of manufacturing aeroplane engines and parts, a number of the largest concerns in the country are taking up the manufacture of materials and supplies. A few years ago it was considered almost impossible to secure good aviation engines in this country. Now this impression has vanished.



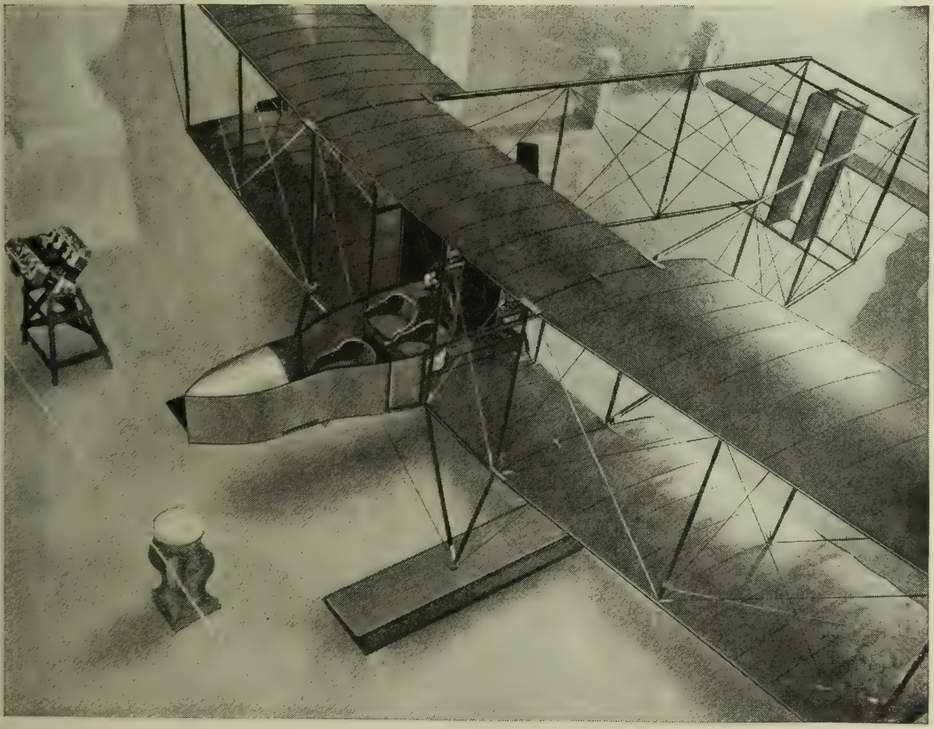
The Bullet, One of the New Machines at the Aeronautic Show. 100-Horsepower Air-Cooled Gnome Motor is Inclosed in the Blunt Head. A Three-Bladed Propeller is Driven by Shaft



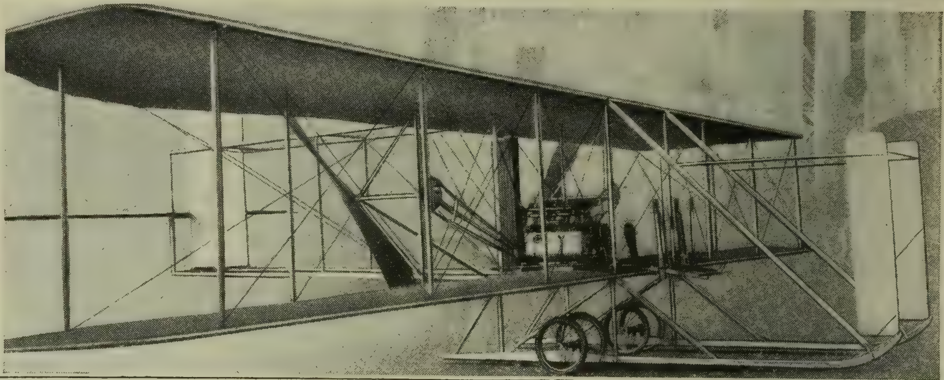
North Carolina Product Which Its Inventor Expects will Carry 7 Passengers and Freight. Although It has Never been Off the Ground to Any Considerable Extent, It is "Guaranteed to Fly"



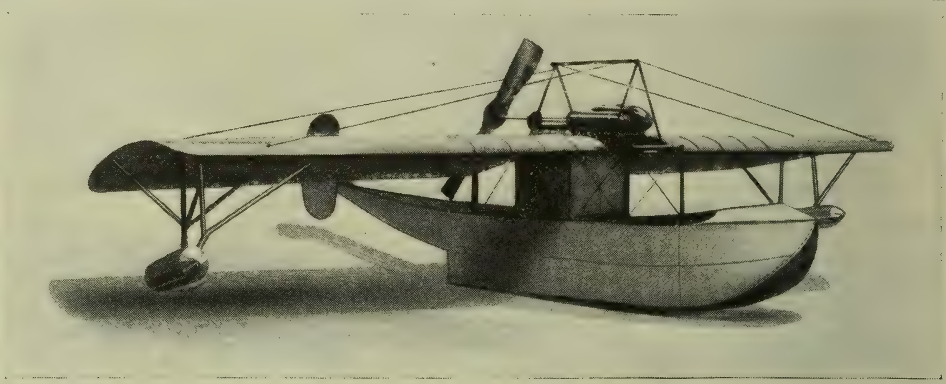
A Multiplane, Built by a Kansas Inventor and Exhibited at Aeronautic Show, Which has Not been Given a Chance to Make Records Yet, as It has Not Flown



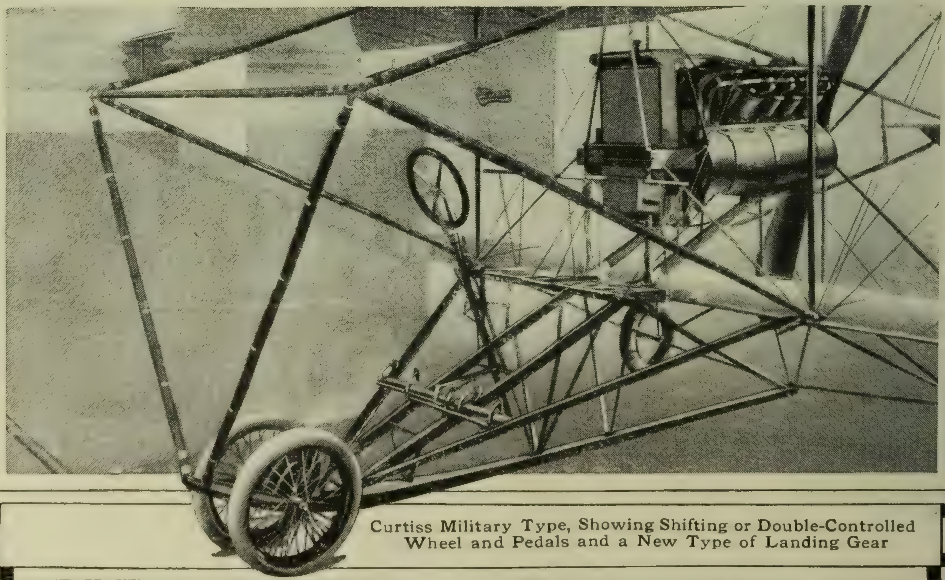
A New Hydro-Aeroplane Provided with Three Seats and Designed for the Purpose of Carrying Passengers



The Improved Wright 1912 Model at the Show; While Several Changes may be Noted, the Machine Clings Closely to the Original Wright Lines



The Queen Aero Boat with a Boat Body Instead of Floats. A Radically New Type Designed by Grover Cleveland Loening

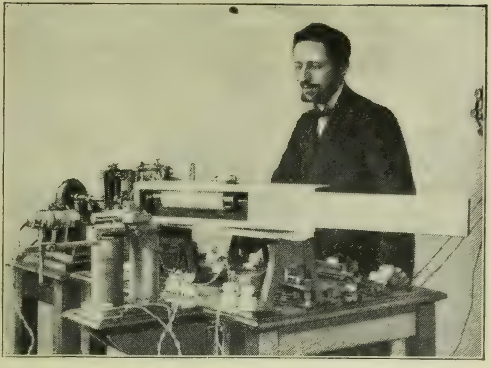


Curtiss Military Type, Showing Shifting or Double-Controlled Wheel and Pedals and a New Type of Landing Gear

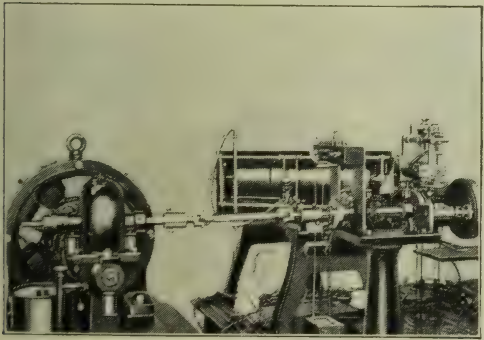
TRANSMITTING PICTURES BY WIRE

One of the daily papers of Paris is now publishing half-tone engravings sent by wire from Monte Carlo and the south of France, a distance of about 500 miles, using the apparatus developed by Dr. Korn. The early troubles that prevented practical use of the picture-transmitting device are claimed to have been the great disturbances on the line rather than any fault of the apparatus, but in the present apparatus the transparent film is replaced by a copper film. This is rolled around a cylinder, and, while revolving, a metal point goes all over the image and makes electric contacts corresponding to the whites and blacks. The copper film is prepared entirely by photographic means, and is printed from a negative in such a way as to be covered with fine lines representing the dots of a half-tone. Such lines are thick or thin, according to the parts of the image, and are in insulating gelatine, while the whites are represented by the bare copper. When the point goes over the copper, a current flows; but when the point is passing over the gelatine, the current is interrupted, and this gives impulses on the line.

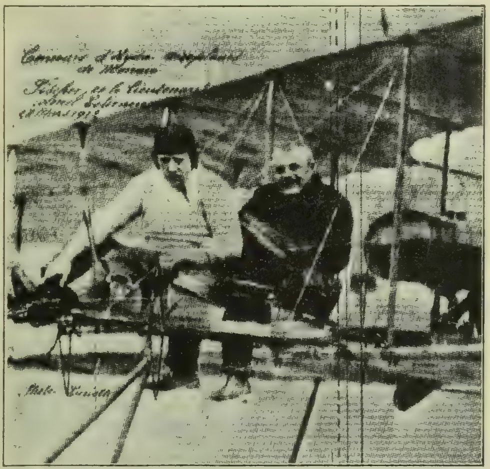
At the receiving end of the line is a revolving cylinder carrying a photographic film, on which a beam of light, coming through a pinhole, plays. A shutter operated by the line current controls this beam so that it produces a picture like the one on the copper film, and this film is then developed and turned over to the photo-engraving rooms for reproduction in the newspaper.



The Receiving End of the Apparatus, Showing the Cylinder with the Photo Film upon It



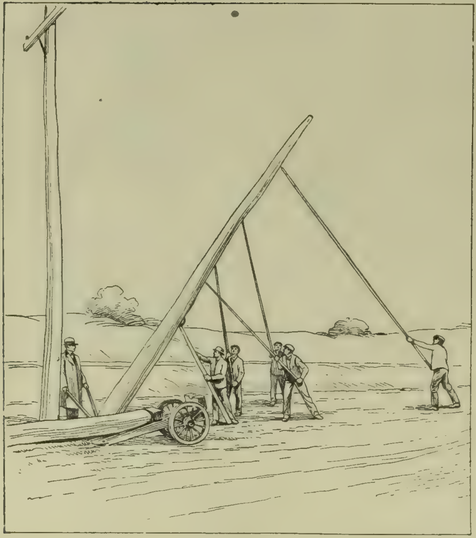
The Transmitting End of the Picture-Sending Apparatus



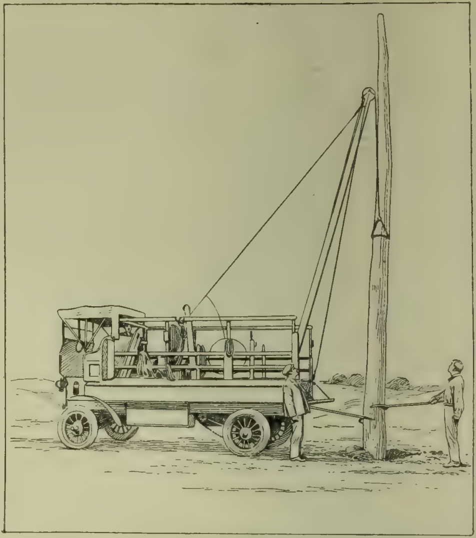
An Aviation Picture Transmitted from Monte Carlo to Paris

Quick photographic reporting is thus made possible. During recent aeroplane events in the bay at Monaco, for instance, the operator took photographs in the afternoon, quickly prepared the copper film and placed it in the apparatus, and a few minutes later the reproductions were available for publication in Paris.

ℭA New England manufacturer has just perfected an electric lighting plant for aeroplanes which has a dynamo that weighs 20 lb.



Placing a Telephone Pole in Position by the Old Method



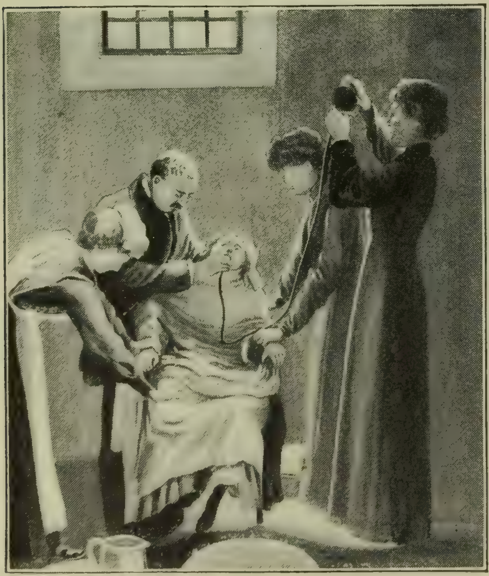
Courtesy the Motor World

Setting a Telephone Pole in Place by Means of a Motor Truck

MOTOR TRUCKS AS POLE ERECTORS

The practicability of the motor truck as an engine for the erection of telephone poles has been clearly demonstrated by the New York Telephone Company. The accompanying illustrations show the old way of erecting the poles, and the modern method of performing the same task.

FEEDING SUFFRAGETTES THROUGH THE NOSE



Courtesy Graphic, London

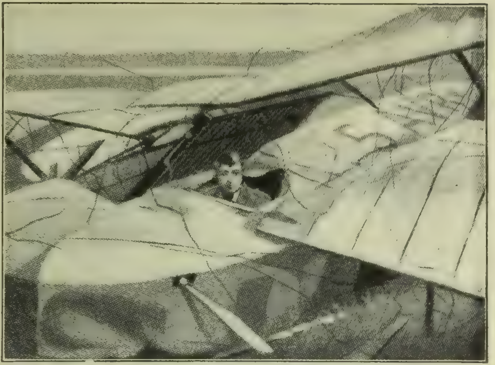
Feeding a Suffragette through the Nose; the Plan Adopted by the Prison Authorities to Break the "Hunger Strike"

The accompanying illustration, all external indications to the contrary, does not show a treatment for adenoids, but the forcible feeding through the nose of an English suffragette who refused to partake of food. This remarkable system of feeding is practiced by the English prison authorities, owing to the suffragettes adopting the "hunger strike" as a possible means of gaining their demands. The refusal to eat is not a protest against imprisonment, but an endeavor to obtain the treatment previously accorded to political prisoners.

¶The growth of the automobile business in the last 14 years is shown by the fact that in 1898 there were 25 concerns capitalized at $2,000,000 making motor cars while in 1912 there are 300 concerns and the capital invested in the business is over $200,000,000.

IN THE CENTER OF THE WRECK

During a recent meet at Brooklands, Eng., Lieutenant Parke, flying with a passenger in an Avro biplane, met with a bad spill while making a turn. W. H. Fayer, the passenger, is shown in the center of the wreck, viewing the damage.



The Passenger of a Wrecked Aeroplane Surveying the Damage

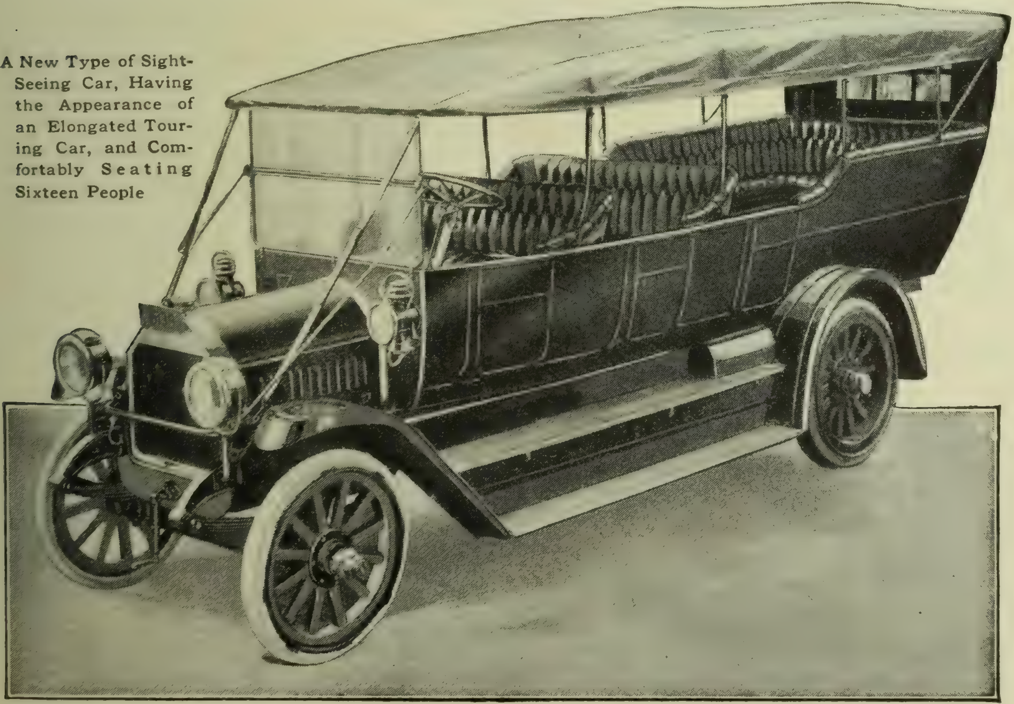
¶An official agricultural bulletin states that 1,600,000,000 lb. of butter are made in this country annually.

"REFINED" "RUBBER-NECK" MOTORBUS

Efforts are being made toward refining the much abused "rubber-neck" motorbus, a vehicle that has been so joked about and laughed at that many people are ashamed to be seen riding in one. The illustration shows one of the new serviceable, yet good-looking, sight-seeing cars described as "refined." It is built to closely resemble the touring-car type of machine, embodying graceful lines. It is said to be the first sight-seeing car of a full fore and side-door design on the market. The seats are so arranged as to comfortably accommodate 16 people.

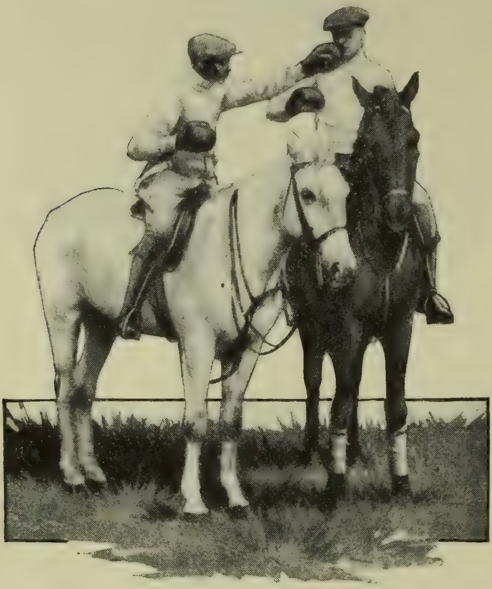
The first of this type of car finished was shipped to Seattle, where it is being used in conducting parties through the famous Rainier National Park.

A New Type of Sight-Seeing Car, Having the Appearance of an Elongated Touring Car, and Comfortably Seating Sixteen People



BOXING ON HORSEBACK

Boxing on horseback is a new sport novelty which was recently introduced in Germany by a German officer who was a pupil of the Anglo-American Boxing Club of Berlin. The men shown in the illustration are Joe Edwards, a former welterweight champion of England, and Bobby Dobbs, at one time a well-known colored fighter in the United States, and now 53 years old. They are both connected with the boxing club in Berlin, which has had much to do with popularizing boxing in Germany.



Boxing on Horseback is a New Sport Novelty Recently Introduced in Germany

TRANSPARENT GLASS OF GREAT STRENGTH

A French manufacturer has succeeded in producing a perfectly transparent glass of extraordinary strength, designed especially for use in automobile windshields, for windows in railroad cars, and other purposes where glass may be subjected to sudden shocks. Tests are claimed to show that even wire-reinforced glass has far less resistance than this new glass, the former having been completely shattered by shocks which only succeeded in cracking the latter.

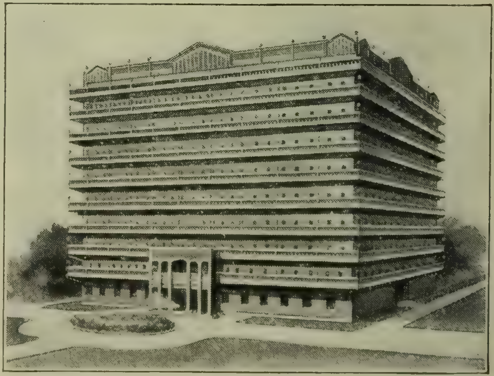
The new glass consists of two layers of glass having a transparent sheet of celluloid between them. The process of manufacture is a rather delicate one, as the two layers of glass have to be attached to either side of the celluloid sheet by means of a special adhesive substance, the whole being then passed through a hydraulic press.

MOVING PICTURES OF THE AURORA BOREALIS

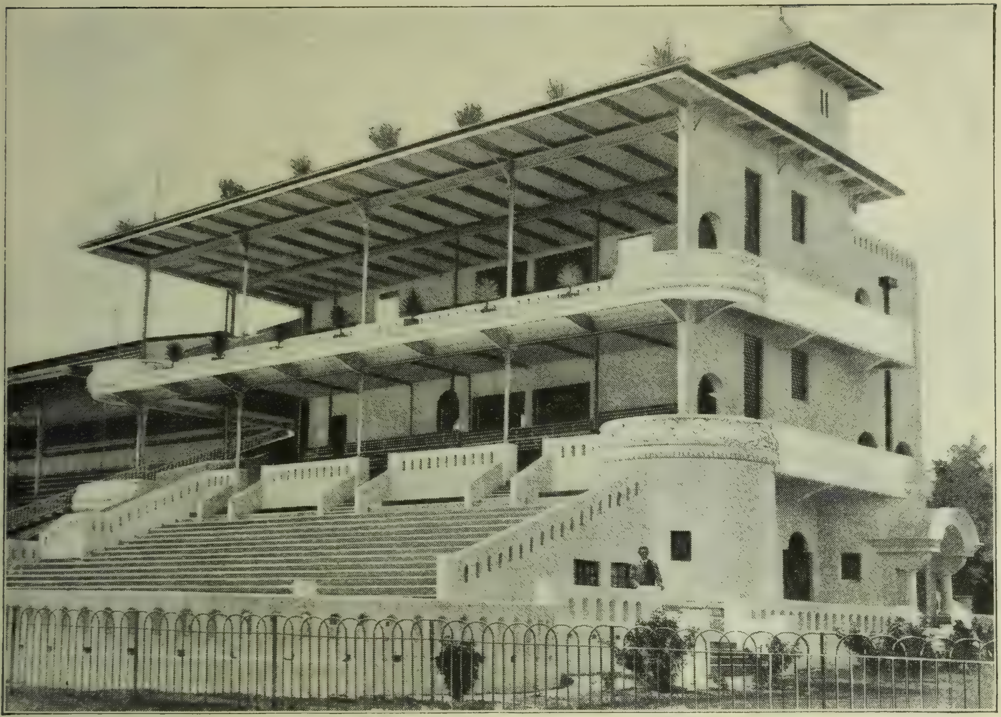
A new camera for photographing the aurora borealis has just been constructed for Professor Carl Stormer, of the Christiania University. The apparatus will be used to measure the relative brightness of the Northern Lights at different periods, and to enable a cinematograph reproduction of the phenomenon to be made afterward. The pictures are to be taken at night, and will consequently require a long exposure, which will extend from two and a half to eight minutes each. It is expected that the results will prove of the greatest scientific value.

A SKYSCRAPER FOR THE DEAD

The accompanying illustration shows an unusual idea in a community mausoleum. It is a proposed skyscraper mausoleum having 10 stories, each of which has a wide balcony. According to the plans it will contain 532 private



Proposed Skyscraper Community Mausoleum



The Members' Stand on the Course of the Johannesburg Turf Club, South Africa

vaults, and a corridor connecting with a large reception room, several comfort rooms and a chapel equipped with an organ and seating 250 persons.

ELECTRIC BABY'S SMILE TWELVE FEET WIDE

The largest single electric sign in the world depicts a baby's face that alternately smiles and sheds tears on the crowds that throng Broadway, New York. The smile is some 12 ft. wide when it reaches its fullest development and each individual tear is 2 ft. long by 10 in. wide. The sign itself is 85 ft. high by 106 ft. wide and contains a total of 9,010 sq. ft. of space. The child's head is 40 ft. high. The sign weighs 80 tons and contains 4,050 electric lights.

¶It has cost the government $1,931,208 more to build the battleship "Florida" at a government yard than it cost to build the "Utah" by contract.

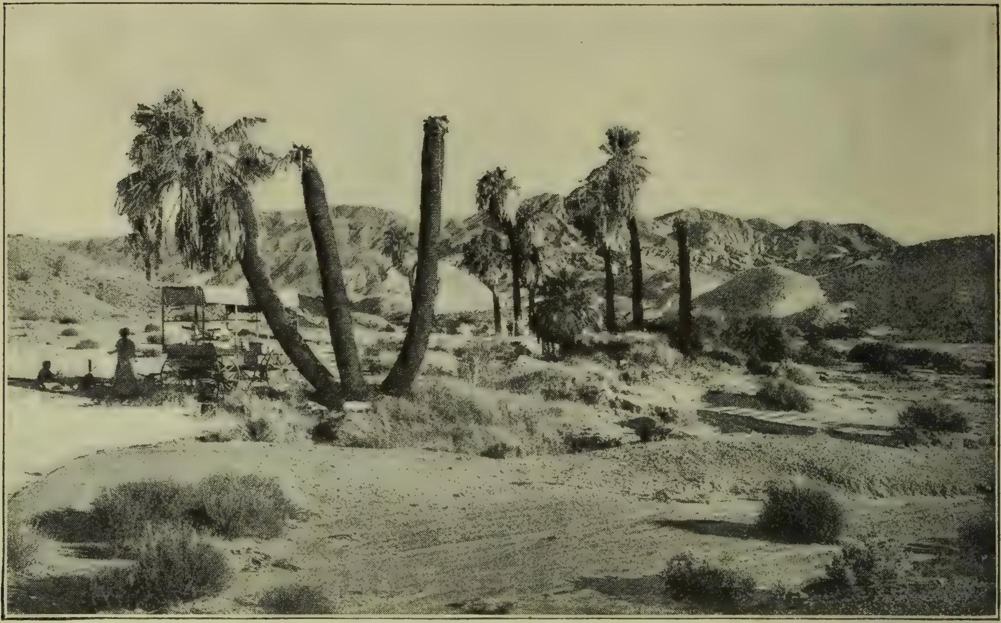
JOHANNESBURG RACE COURSE HAS PALATIAL STAND

Horse racing in South Africa is a sport carried on as extensively as in Europe, and several of the race courses compare favorably with those of England. The illustration shows the newly erected members' stand of the Johannesburg Turf Club's course. This stand cost about $60,000 and is one of the finest in the world devoted to such a purpose.

A FAMOUS WATER HOLE IN CALIFORNIA

Seventeen Palms Spring is one of the famous water holes of the Southern California desert, the vivifying water of which has brought renewed life and hope to thousands of desert travelers, while it has been likewise the unreached goal of scores more whose bones have bleached the old overland trails—those who failed to get through.

The spring would be considered but a poor enough watering place by those

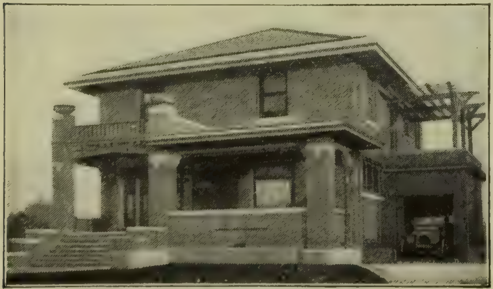


Seventeen Palms Spring, Southern California, Which Has Been a Welcome Sight to Many a Tired and Thirsty Pioneer

of us who know only the east with its multitude of water supplies, and who would deem it an almost unbearable hardship to travel afoot for a single day without water. But to those who have gone two days and nights, or possibly three, with no water and under a brazen sun and a mercury at 120 or worse in the shade, the Seventeen Palms Spring is life itself. The palms which have given the place its name, seem to eke out but a precarious existence, and there are no longer 17 of them, some having died. Yet, sickly as they appear, they are a welcome sight to man and beast who travel this route.

PORTE-COCHERE AUTO GARAGE

An ingenious idea in automobile garages has been worked out by Dr. H. Leslie Moore, of Dallas, Texas. His garage is attached to the side of the house in the position that a porte-cochere would occupy if provided, and in appearance it very much resembles the latter. The inside door of the garage opens into a small hall leading into the rest of the house, and the doctor may step from it directly into his machine.



The Porte-Cochere Garage of a Dallas, Texas, Physician

SIGNAL DISKS PLANNED TO STOP JOY-RIDING

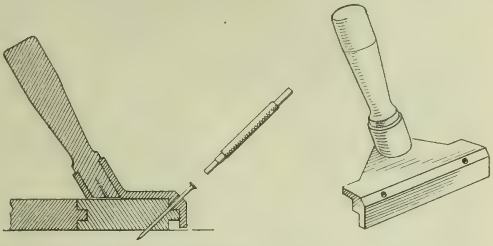
The assistant manager of a New York detective agency has recently taken out a patent on a device intended to check joy-riding. It consists of a copper plate, which may be fastened to any part of the car where it will be clearly visible to the police. On this plate is a hinged metal disk, the hinge being bolted to the middle of the plate in a substantial manner. When the owner of an automobile or his authorized agent is in charge of the car, the disk is turned down and locked in place, and in this position displays a black enameled circle. When the owner is through with the car and does not wish anyone to use it, he unlocks the padlock, turns up the disk until it lies flatly against the plate, and relocks it, the plate showing two bright red spots when in this position. The plan is to notify the police or others engaged in preserving the peace that there is something wrong when a car appears on the street with two red disks showing.

TENTED "CITY" ON HOTEL ROOF

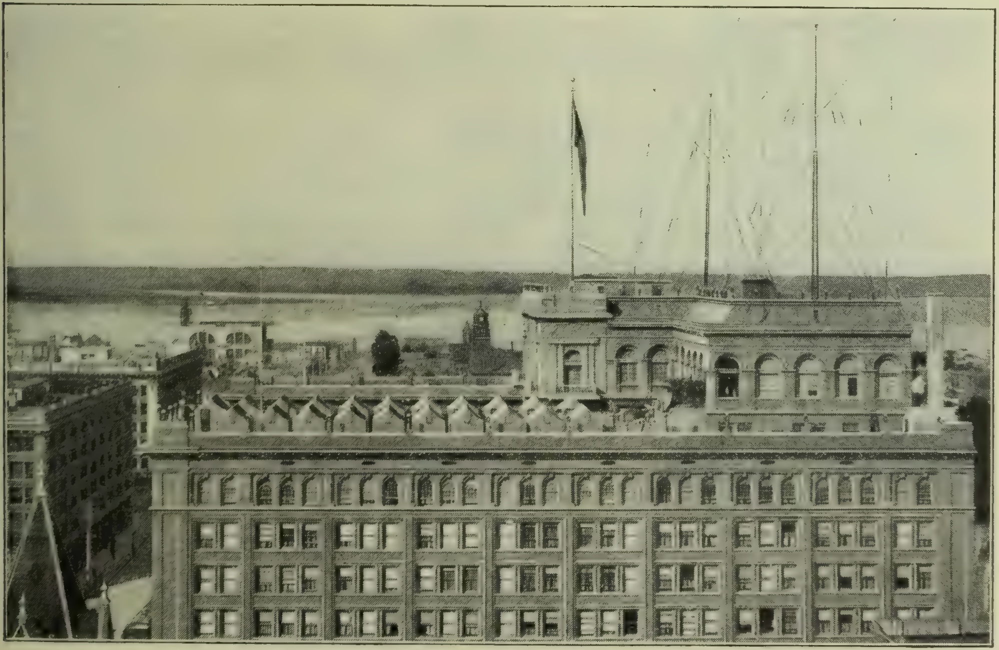
The management of one of the big hotels at San Diego, Cal., has solved the problem of hotel congestion and satisfied the outdoor-air enthusiasts by erecting 22 large tents on the roof. Each tent contains a bed, washstand, dresser, wardrobe, and a chair. Many of the guests prefer the tents to the most luxurious rooms of the hotel.

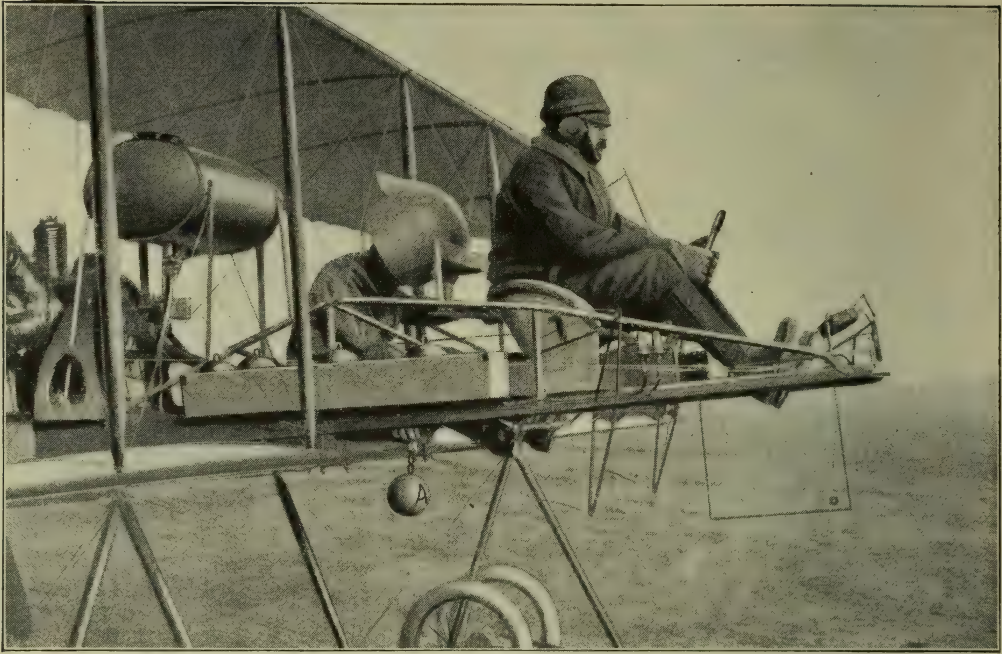
COMBINED FLOOR SET, NAIL SET AND SHIELD

An ingenious device, designed to facilitate the laying of hardwood floors, was recently patented by an inventor of Lawrence, Kansas. It makes possible an accurate set of the boards, an accurate driving of the nails at the correct angle, and also protects the floor from being bruised during the operation of driving the nails through the holes.


A Device Which Materially Aids in the Laying of Floors

ℭThe cost of stopping an ordinary train of passenger cars that is moving at the rate of 50 miles an hour is said to be $1, the time lost being estimated at 145 seconds.

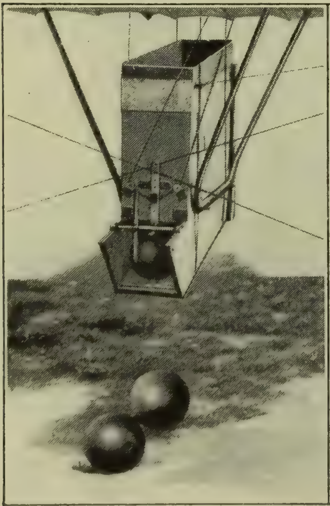

Twenty-Two Sleeping Tents on the Roof of One of the Big Hotels in San Diego, Cal.



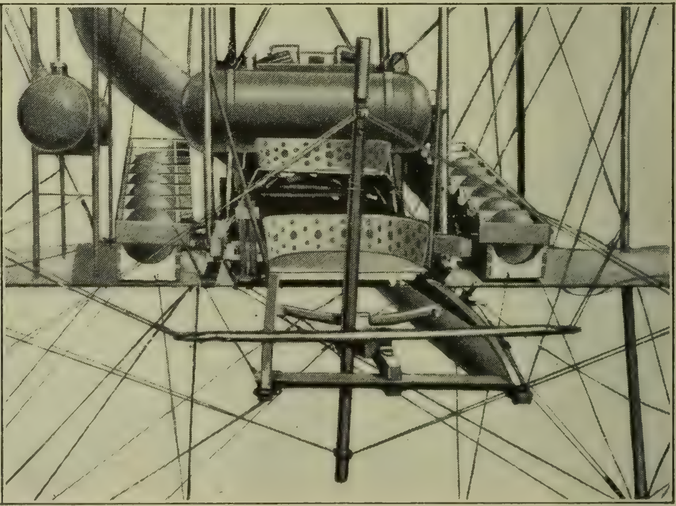
Lieutenant Bousquet in His Biplane. The Officer Who Drops Bombs is Protected by a Windshield, and on Each Side of Him are Ammunition Boxes

FRENCH WAR AEROPLANE

Aeroplane tests are being conducted by the French army on the historic drill ground at Chalons in an endeavor to determine to what extent aeroplanes can be used as flying artillery. The accompanying illustrations show an interesting aerial bomb-dropping equipment which was designed by Lieutenant Bousquet of the French army.



Bomb-Throwing Apparatus, Showing Two Bombs Just Discharged



A Close View of the Seating Arrangement, Showing the Cases Containing the Bombs Arranged along Both Sides

THE WESTERNIZATION OF THE HOLY LAND

By H. J. SHEPSTONE

VERY rapidly, and with so little publicity that the rest of the world scarcely recognizes it, the westernization of Palestine has been going on ever since the triumph of the Young Turkish party over Abdul Hamid, the late Sultan, some three years ago. In political, educational, and particularly in economic reforms, there has been a great deal of progress. Important railroad and transportation concessions have been granted, while Jerusalem, Jericho, and Palestine's newest city, Beersheba, have been given a much needed water supply.

Until quite recently the Holy City has been entirely dependent for its water upon the rainfall. Now it is brought to the city from Solomon's old pools, to the south of Bethlehem, by means of specially laid pipes. Thus the ancient cisterns, built to supply Jerusalem with water in Solomon's time, have been repaired and made to supply the Jerusalem of today with pure water. Then, what is believed to be the well used by Abraham at Beersheba now supplies that town with water by means of a modern motor pump, while Jericho obtains fresh water from Elisha's Fountain by means of specially installed pumps and pipes.

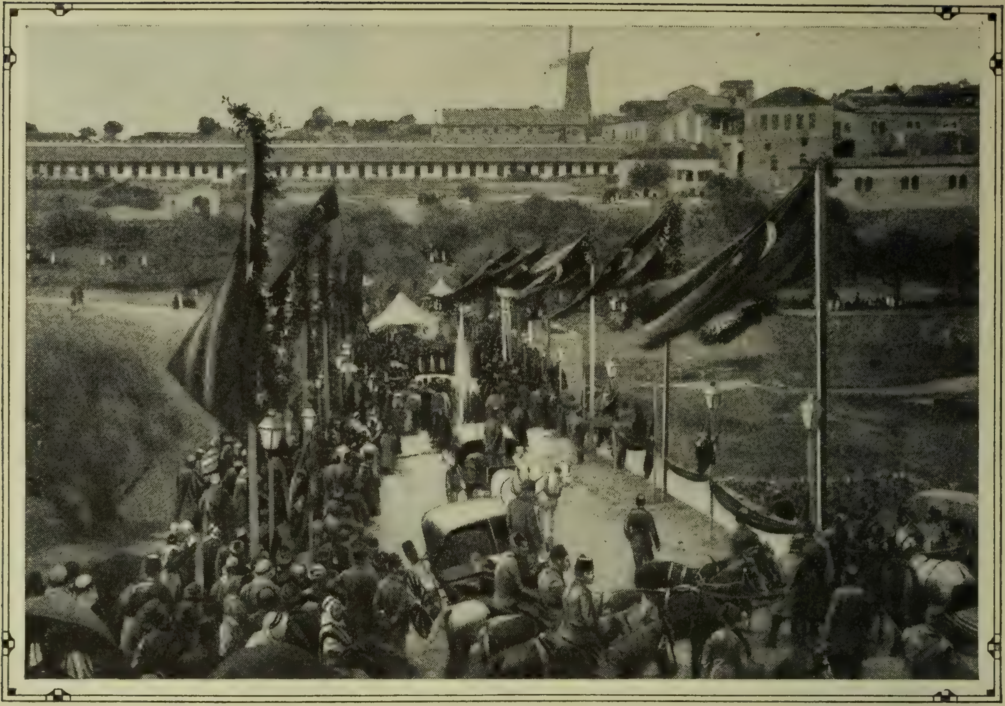
Both Damascus and Beirut have also recently had their water supplies greatly improved, and now boast of their electric tramway services. Damascus was the first city in bible lands to have electric trams and electric light. This is remarkable when we remember that it is the oldest city in the world, having been a place of great importance in the days of Abraham. In the near future, however, Jerusalem will undoubtedly possess electric trams, and representatives of an important American syndicate are now in the Holy City submitting plans for equipping it with an efficient tramway service as well as with electric light.

Indeed, in every department of commercial enterprise and activity, modern methods are being rapidly brought into vogue. On the rich plains of Sharon and also on the tablelands between Jaffa and Jerusalem, steam-driven threshing machines and modern harvesters may be seen, taking the place of the primitive threshing floors. Then, all over the country, particularly in the orange groves, the primitive way of raising water for irrigation and other purposes is being superseded by pumps driven by kerosene motors.

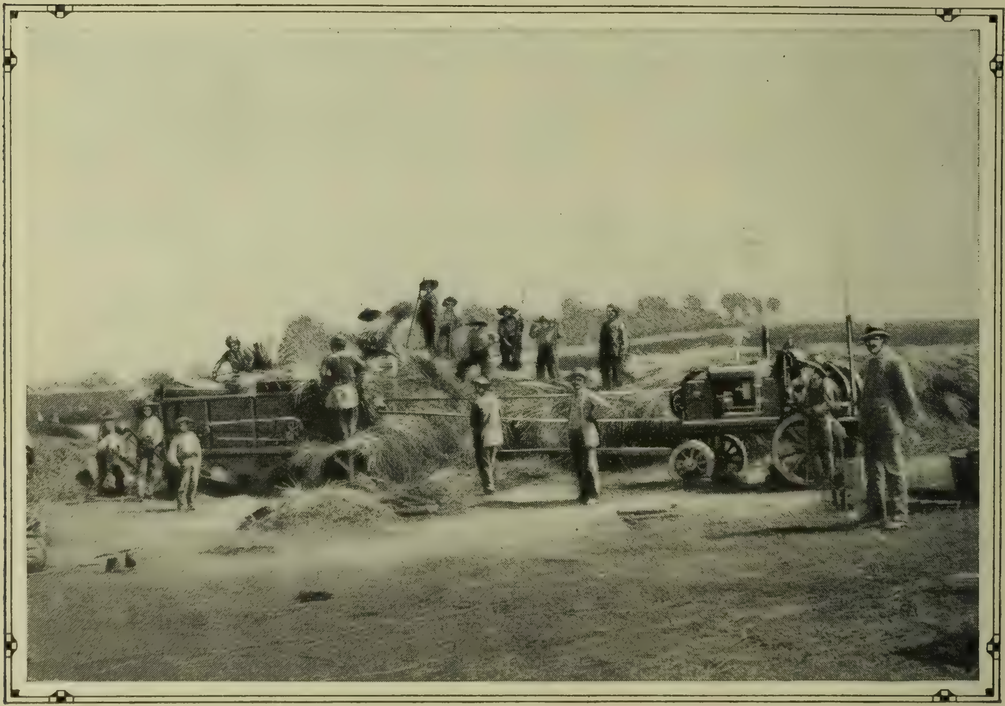
Then, in Jerusalem itself much has been done in widening some of the narrower thoroughfares, particularly in the business quarters of the town. The city is now better drained and its streets better kept. Two modern water-carts were recently imported and are now being used and the municipality has been supplied with a modern steam fire-extinguishing pump. It was but recently also that the Turkish authorities granted a concession to several American and English companies for the construction and exclusive operation of telephones both in the Turkish capital and also in Jerusalem, while an English company is about to furnish the Jerusalem police with bicycles. The very latest appliances may be detected in the building operations that are now going on and reinforced concrete is being used in some of the more important edifices.

On that historic sheet of water, the Dead Sea, there is now a motorboat, the only self-propelled craft at present on Palestine waters. For permission to run this craft its owner pays the government a monthly rental of $50. The authorities in Constantinople are now considering applications for permission to place similar craft upon the Sea of Galilee and the River Jordan.

Perhaps it is in transportation facilities that the development is most marked. One has only to add that when the Turkish parliament met in



The Opening of Modern Waterworks in Jerusalem was Attended with Elaborate Ceremonies Participated in by All Classes of the City's People



Power-Driven Threshing Machines and Harvesting Apparatus are Common Sights on the Plains of Sharon, between Jaffa and Jerusalem

Modern Watering Cart Sprinkling Streets of Jerusalem

Trolley Cars Now Traverse Streets of Damascus

Motorboat "Sheikh Jolal," which Carries Passengers and Freight to Ports on the Dead Sea

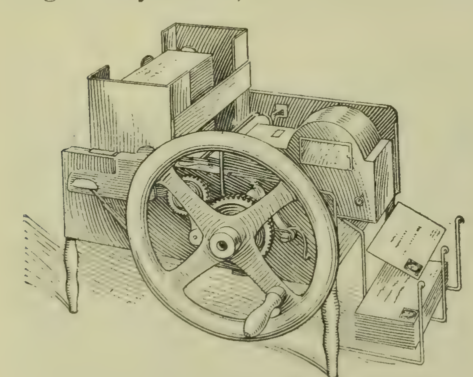
One of the Four Pathway Lines in the Holy Land

Up-to-Date Reinforced Concrete Construction has been Adopted in Jerusalem the spring, there were submitted to it plans for the construction of no fewer than 1,500 miles of railroad, with mineral and oil rights in the Asiatic dominions of the Sultan, to show the rapid development now going on in this part of the world. The lines of the Hedjaz Railroad are to be carried with all speed across the 285 miles of desert between Medina and Mecca. Starting from Damascus, this line runs almost due south through wild and sterile country for more than 820 miles to Medina, the burial place of Mohammed. It is principally used for carrying Mohammedan pilgrims. At many of its more important stations one can now send telegrams in any European language to all parts of the world. Until quite recently they had to be written in either the Turkish or the Arabic language.

This, of course, is by no means the only railroad in Palestine. The first to be opened was that which connects the seaport of Jaffa with Jerusalem. Then followed one from Beirut, on the coast, to Damascus, and more recently, the line from Haifa, also on the coast, round the southern end of the Sea of Galilee to Damascus. Of the lines yet to be built in Asiatic Turkey, one will extend from Samsoon, on the Black Sea, in a southeasterly direction to a point near the Persian border. Another will start from some port on the Mediterranean, not yet determined, and stretch in a northeasterly direction to Lake Van, crossing the other line. When the famous Bagdad Railroad has progressed another 200 miles, with the Bosphorus spanned by a bridge, and the Hedjaz enterprise completed, Mecca will be in direct railroad communication with Constantinople, and also with the great centers of Europe. When the other lines now projected are completed, Persia will be connected with the Mediterranean Sea, and Nineveh, the ancient capital of Sennacherib, will be a halfway station between a reformed kingdom of the Shah and a Palestine which has been quickened to modern life by steel rails, telegraphs, telephones and western business methods.

LETTER SEALING AND STAMPING MACHINE

This machine, which is but little larger than a standard typewriter and weighs only 50 lb., is claimed to seal, stamp and count as many as 7,000 letters per hour, handling envelopes of various size and thickness without adjustment. The letters are inserted, flaps down, in the box on the front of the machine, and a reciprocating feeding blade, from which the moisture for the envelope flap is taken, moves forward between the flap and the envelope proper, carrying the envelope forward to the soft-rubber sealing rolls. During this operation the stamp is fed forward from the roll of stamps in the fore part of the machine, where the stamp is moistened, then cut off and carried to the moving envelope, where the process of stamp application and letter sealing is automatically completed. The machine illustrated is driven by a hand wheel, but power may be substituted.



A Machine That Will Seal, Stamp and Count Several Thousand Letters per Hour

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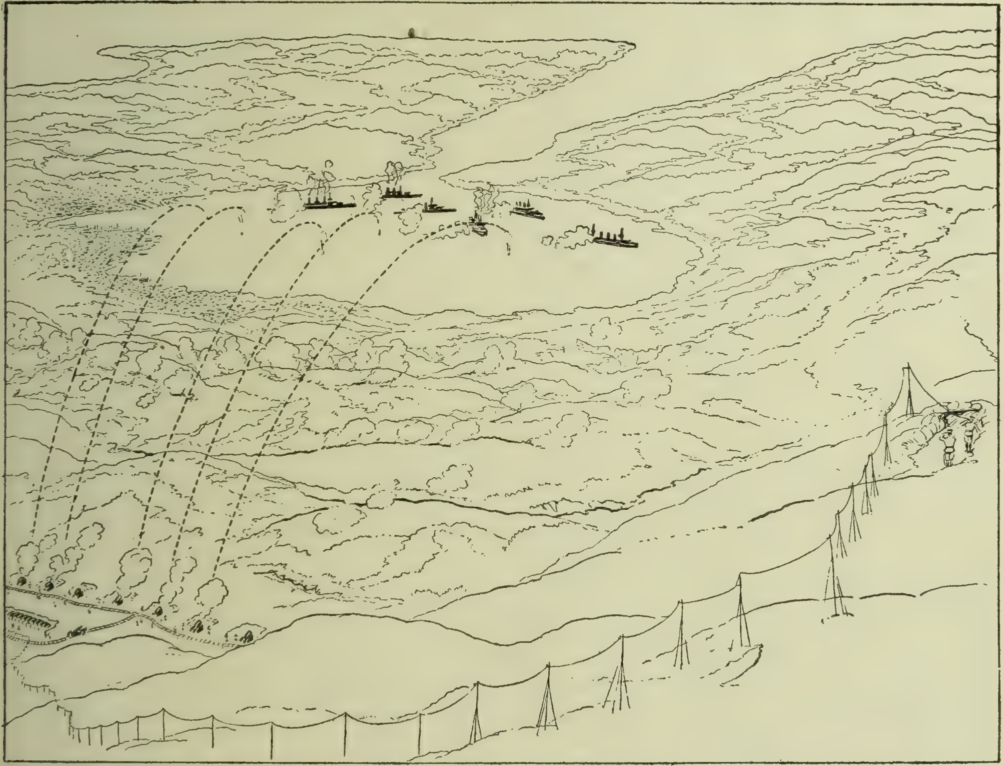
When the Panama Canal is finished, it will be the greatest coaling station in the world, it being estimated that the coal and oil traffic alone should amount to $10,000,000 annually.

COSTLIEST TELEPHONE LINE EVER BUILT

The costliest mile of telephone line ever erected is the temporary line which the Japanese army experts constructed from the foot to the top of 203-Meter Hill, just outside of Port Arthur, during the siege in the Russo-Japanese war. It might also be asserted that few lines represented the expenditure of so much energy, resourcefulness and courage, to say nothing of human life, or were used for so short a space of time with such tremendous results.



Topographical Map of Port Arthur and Its Defenses, Showing Route of the Costliest Mile of Telephone Line Ever Constructed. Big Japanese Guns in Lower Left-Hand Corner, and Telephone Station at Right; Russian Fleet in the Distance

Early in the siege of Port Arthur the Japanese, finding field guns wholly inadequate to reach the town and harbor, set up half a dozen or more great 10-in. guns, "Osaka babies" they called them. These were placed as near as possible to the main defenses of the town which were located along a semicircular chain of hills, surrounding the harbor. The guns were some four or five miles distant from their main objective, the town and fleet. Between them and their targets interposed this chain of hills, tall and almost impregnable. Hence, using the guns was purely guesswork, something like throwing a stone at a man on the other side of a house. The gunners could not get the slightest idea as to where their shells struck.

Far over to the Japanese right, near the end of the Russian hill forts, was the loftiest point in the district, 203-Meter Hill. From its summit one could look squarely down into the town and harbor of Port Arthur. It was strongly protected by fortifications and also flanked by other Russian forts.

To gain possession of the summit of that hill General Nogi addressed all his skill and force. Its sloping sides were lined with intrenchments protecting thousands of Russian riflemen, while from either side the neighboring forts could pour shot and shell into any attacking force. For a few days the Japanese assaults were simply slaughters. At length Nogi obtained a foothold at the base, and slowly, day by day and by night as well, he worked his way up while 30,000 Russians and hundreds of guns poured their fire into him. Finally he gained the summit, built a small bombproof and left there—two men and a telephone!

That was all, but it was all he needed. Thousands of Japanese soldiers protected these two from Russian attacks, which continued ceaselessly, for those two men with the telephone could do more harm than all the rest of the Japanese army. Their telephone line ran down the hill and, thence, to the great "Osaka babies." At a signal from the man at the phone, great shells were flung over the hills toward Port Arthur. The men on the hill watched their landing through field glasses; then they telephoned that gun No. 1 had struck too far right or left of some battleship or arsenal. Thus corrected, the next shots dropped closer; the telephone man again corrected the gunner. And so, through that single wire, the man at the phone directed the fire of the great guns until the Russian fleet, batteries, and arsenals, powerless against such an enemy, were abandoned.

The fate of Port Arthur was decided by the man at the phone. But it had cost dearly. What the Russian loss was is not exactly known, but the Japanese lost 10,000 killed and wounded, expended hundreds of thousands of rounds of ammunition, besides the time and energy of a great army for a period of more than a fortnight, in running that last mile of wire to the top of the hill. It is therefore safe to say that the cost of no other mile of wire ever even approached such a tremendous sum. But, from the Japanese point of view, it was worth it.

AUTOMOBILE USED TO LIGHT A TRAIN

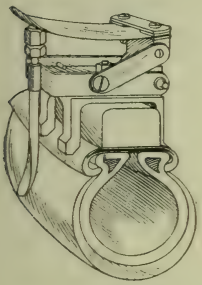
One of the special trains used as a hotel during the automobile races recently held in Savannah, Ga., developed troubles in its electric generating mechanism, thus interfering with its lighting system. The difficulty was remedied by renting an electric automobile and connecting its batteries with the lighting circuit of the train by cable. All lights were furnished by this method during the time the train was side-tracked at the race course.

An Electric Automobile Furnishing Current to Light a Special Train, Side-Tracked at the Savannah Automobile Races

VIOLINS WITHSTAND HEAVY STRAINS

Few violinists give any thought to the amount of pressure exerted on the top of a violin by the bridge, and the amount of tension of violin strings, yet both are very considerable. The total pressure on the bridge, and thus on the top of the violin, is, according to the Violinist, nearly 25 lb., and it takes a pulling force at the pegs of nearly 64 lb. to bring the strings to "international" pitch. The downward pressure on the E-string side of the bridge is a trifle over 11 lb., and that of the G-string side, nearly 10 lb. This tension, or pull on the string, is supported by four small pegs of wood relying on friction for their sticking qualities. This friction hold must exceed an average of 15 lb. for each peg, if the string is to hold. Yet the violin is considered to be the most delicate of musical instruments.

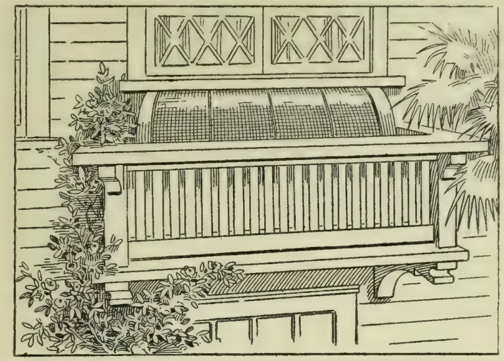
DEFLATED-TIRE ALARM FOR AUTOMOBILES



A French device that informs the driver of an automobile when a tire becomes deflated beyond a certain degree, is shown in operative position in the accompanying drawing. It is attached to the wheel rim, the vertical member being adjustable to any desired depth. When a tire becomes deflated to such an extent that this vertical member touches the ground, it strikes against a piece of spring steel, causing this to vibrate violently and produce a strident alarm sound once in each revolution of the wheel.

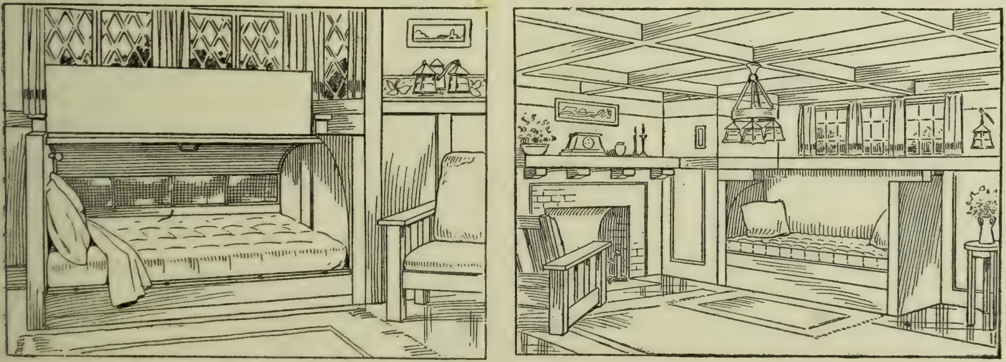
A NEW OUTDOOR-INDOOR BED

Beginning with the bungalow, Southern California home builders have became noted for the innovations they have made in dwelling-house architecture and built-in interior effects. The very latest of the latter is a bed which, at the will of the occupant, may be either in the room or outside in the open air, yet, paradoxical as it may seem, remain in the same place. This is accomplished by building the bed inclosure in the outer wall of the house or apartment, the inclosure, when the bed is closed, appearing as a davenport, inside the room, and from the exterior as a balcony. The inclosure projects, outside, from 30 to 36 in. from the wall.



The Bed Inclosure, Appearing from the Exterior as a Balcony

Over the bed is a movable half-dome which may be lowered either over the outside end of the bed, effectually shutting off the outer air, rain or dust; or over the inside part, thus placing the sleeper entirely outside the room in the open air. From a hygienic standpoint, this new bed far surpasses the outdoor sleeping-porch bed, for the reason that when retiring to his sleeping chamber, the occupant takes with



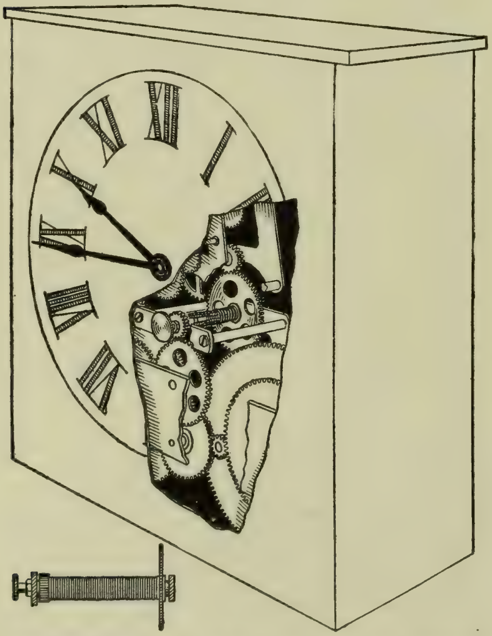
The Movable Half-Dome, Which may be Lowered Over the Outer Side of the Bed, or Over the Inner Side, the Latter Arrangement Placing the Sleeper Entirely Outside the Room. The Appearance Inside is That of a Davenport him a volume of warm air from the room and thus experiences a gradual change of temperature, instead of the sudden transition from a warm room to a cold porch. In case of storm, the dome can be swung over completely to shut out the rain.

Another advantage of this bed is the saving in space, for the inside projection is utilized as a davenport and, as compared with the sleeping porch, there is a large saving in space outside.

The bed may be either installed in a house already completed, or built in while it is being erected.

MAKING A CLOCK RUN A YEAR

The attachment of a small device recently perfected by a Chicago clock expert will, if it accomplishes what is claimed for it, turn an ordinary eight-day clock of standard make into a clock that will run more than a year without rewinding. Not only is it claimed that the clock will run a year, but it is also stated that its power plant—its springs and the wheels that transmit their action to the works of the clock—can be used to operate other mechanical devices that are made to run with clockworks. The device that accomplishes all this is called a "governor," and its use converts the clock into what is termed a "differential clock," because it permits the operation of other pieces of mechanism besides the time-measuring machinery.



The Clock That Runs a Full Year without Stopping, Showing, Just under the Hands of the Clock Face, the Governor which Does the Work. A Side View of the Governor is Below

The governor is a small steel shaft on which is mounted a helical spring. The shaft is so constructed that a portion of it can be expanded so that the amount of power from the helical spring can be regulated, and no more supplied to the mechanism actuating the time-measuring part of the clock than is absolutely necessary. The clock springs are so adjusted to the governor that when the shaft has been expanded and all the power in the unexpanded section has been used, these springs automatically turn the helical spring to give it additional power. In this manner the clock springs proper are called into action for time measuring only when the helical spring exhausts itself, and, therefore, will keep the clock going for a much longer period than without such a device as the governor. A clock equipped with a governor has actually run 418 days without rewinding. The tension of the helical spring is adjusted with a setscrew and it can be adapted practically to all standard makes of clocks.

HIGH-EFFICIENCY WATER WHEELS

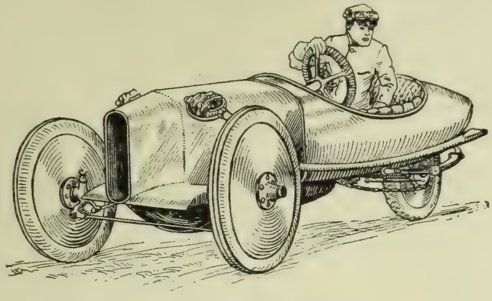
The performance of three low-head water wheels designed by Prof. S. J. Zowski, of the University of Michigan, far surpasses the highest power of any other wheels given a recorded test. The wheel which previously held the record, was 28 in. in diameter, and, in the Holyoke testing flume, its best efficiency was 86.2 per cent, at 52.8 revolutions per minute, and 2.05 hp., under 1-ft. head.

The wheels designed by Professor Zowski, all of which were 30 in. in diameter, were tested with the same draft tube and test arrangements, only the runner and guide vanes being changed. The first of these wheels showed a maximum efficiency of 87.2 per cent, at 49 revolutions per minute, and 3.18 hp., under 1-ft. head. The second wheel showed a maximum efficiency of 88.75 per cent, at 48 revolutions per minute, and 2.65 hp., under 1-ft. head, while the third wheel, designed to increase the power at maximum efficiency, showed a maximum efficiency of 89.2 per cent, at 50 revolutions per minute, and 3.26 hp., under 1-ft. head.

¶Chewing gum is said to be a peculiarly American habit, merchants having discovered that there is no sale for gum in foreign communities where there are no American residents or tourists.

A RACING DUOCAR

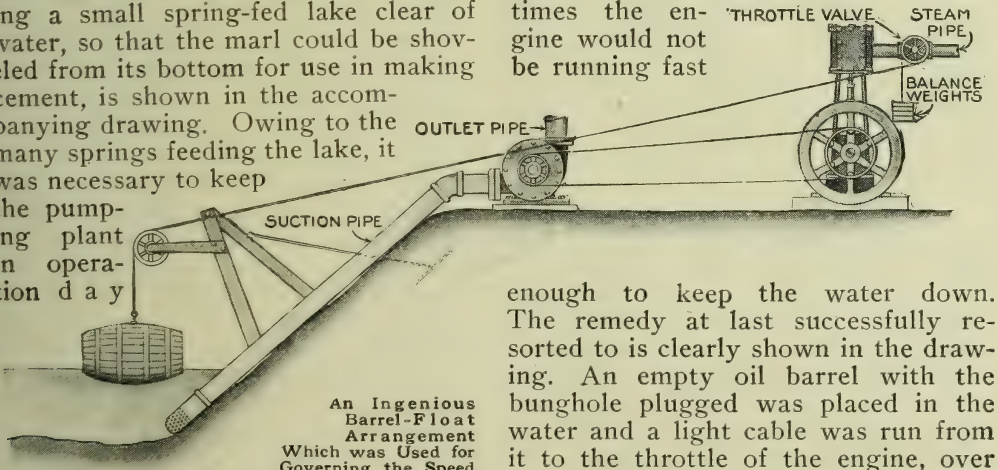
Races for duocars, the name given to the little three-wheeled machines which form the connecting link between the motorcycle and the automobile, were recently held at the Brooklands motor course in England. An idea of how these little racing cars are constructed may be gained from the accompanying illustration.



A Type of Racing Duocar

BARREL FLOAT AS ENGINE CONTROL

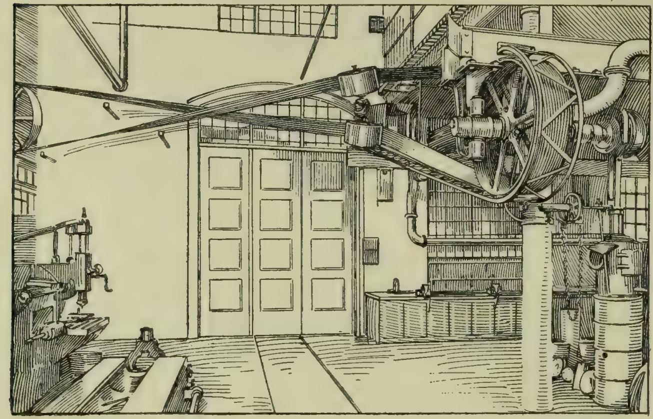
An ingenious method of automatically controlling the speed of a 20-hp. slide-valve steam engine, used in keeping a small spring-fed lake clear of water, so that the marl could be shoveled from its bottom for use in making cement, is shown in the accompanying drawing. Owing to the many springs feeding the lake, it was necessary to keep the pumping plant in operation day and night, but, as the amount of water supplied by the springs varied greatly, and as the engine had no governors, much trouble was experienced in regulating the engine's speed. Sometimes the rotary pump would drain all the water out of the hole and lose its priming, thus causing the engine to race, and at other times the engine would not be running fast enough to keep the water down. The remedy at last successfully resorted to is clearly shown in the drawing. An empty oil barrel with the bunghole plugged was placed in the water and a light cable was run from it to the throttle of the engine, over grooved pulleys. The cable was wound around the last pulley two or three times and a weight was attached to the loose end, to counterbalance the barrel. The device is said to have worked perfectly, the engine speeding up when the water level rose and slowing down when it fell.



An Ingenious Barrel-Float Arrangement Which was Used for Governing the Speed of a Pumping-Plant Engine

BELT TRANSMISSION AROUND A CORNER

A belt transmission that turns a corner is shown in the accompanying illustration. It connects up two shafts which are set a considerable distance apart at different elevations from the floor and at practically right angles to each other. It is claimed that a minimum obstruction of space and the free use of the doorway are thus obtained. The lattice work guard around one of the pulleys and the iron brackets driven into the wall near the other pulley are safety provisions designed to catch the belt should it break.



Interesting Belt Transmission between Two Shafts Set at Almost Right Angles and at Different Elevations from the Floor

LOSS OF QUEUES CAUSES DEMAND FOR HATS

The wholesale cutting off of queues, which was a consequence of the revolution in China, cooled the heads, at least in a literal sense, of the Chinese to such a degree that there arose an enormous and unprecedented demand for head covering. The native hat industry, being but little developed, was unable to keep up with the demand made by the shears, and Japan, where the industry is flourishing, was flooded with orders. The Japanese factories have been working night and day for months to fill the unexpected need of the new republicans.

GREAT BRITAIN ORGANIZES AIR NAVY

Great Britain, at last realizing that an efficient navy of the air is no less urgent in her case than in that of the other great military and naval powers of Europe, has commenced the organization of an aeronautic service on comprehensive lines. With the issuing of a "White-Paper" from the War Office recently, the "Royal Flying Corps" takes its place definitely as a fighting arm. Not only is a reserve of flying men, which may be drawn on in an emergency, to be provided, but a force of "regulars" is to be organized. Aerodromes, landing places and sheds are to be constructed at intervals throughout the country, converting England into one vast airway system with fixed stations; under the auspices of the government, a school is to be opened on Salisbury Plain, and 37 aeroplanes have already been ordered.

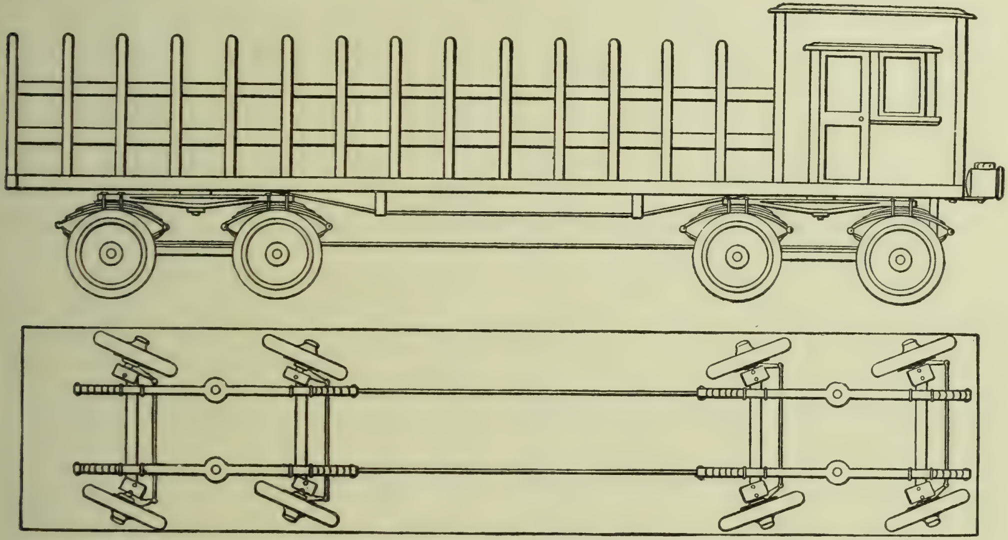
The air navy, as initially planned, will consist of 364 men, seven air squadrons, each squadron comprising 12 aeroplanes; one airship squadron, and one kite squadron.

The course of the Salisbury Plain School will include progressive instruction in the art of flying; instruction in the general principles of mechanics and the construction of engines and aeroplanes; instruction in meteorology; training in observation from the air; instruction in navigation and flying by compass; training in cross-country flights; photography from aeroplanes; signaling by all methods, and instruction in types of warships of all nations.

A frank admission of inferiority is included in the government's announcement of the organization of the air corps. "The government has been impressed by the state of aerial navigation in this country, compared with the progress made by other great naval and military powers. The efficiency of the aeroplane for purposes of military reconnoissance has been proved both in foreign maneuvers and in actual warfare in Tripoli."

EIGHT-WHEELED ELECTRIC MOTOR TRUCK

A new type of electric motor truck, having eight wheels, each provided with an individual motor receiving power from a gasoline-electric generating plant, and with rear wheels that turn automatically with the front wheels in steering, has been designed by a Minneapolis, Minn., inventor. The motor for each wheel is located on the steering knuckle so that it swings with the wheel, thus doing away with the necessity of the universal joint and differential gear.



An Exceptionally Large Gasoline-Electric Truck Having Eight Steering and Drive Wheels. Each Wheel Has Its Own Motor, Located on the Steering Knuckle

GUNPOWDER USED AS FERTILIZER

Gunpowder for raising crops is the latest thing under test in Washington, two great arms of the government, the Navy Department and the Department of Agriculture, being interested in the experiment. It all came about quite accidentally and was not the result of a long series of heavy scientific investigations.

The Navy Department found itself possessed of a lot of old brown powder at the Indian Head factory, down the Potomac River, a short distance from Washington. It was of a kind that was used several years ago and made a lot of smoke. It is known as "cocoa powder" because of its color and also because in its manufacture shredded cocoanut husk was used as a binder.

The navy people tried to trade it off to a big South American firm for nitrate to be used in making the new smokeless powder, but the Chilean importers could not see it even though revolutions in that part of the world are not infrequent and most any kind of powder will serve for a hastily hatched uprising. A bright young naval officer determined to get rid of the powder. There was a million and a half pounds of it on hand and it contained about 80 per cent potassium nitrate, a most valuable fertilizer constituent.

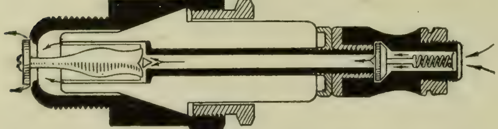
The officer went to the Department of Agriculture and offered them the explosive. The scientists there said that theoretically such powder was a good fertilizer, but that they really did not care to try it at their experiment farms, powder being decidedly out of their peaceful line of business. However, they were deeply interested and would like to see some of it tried on crops, suggesting Indian Head and some of the army posts as the most appropriate places for the trials.

So the navy folk mixed up a lot of the stuff with Potomac River water, fresh from the end of the wharf at Indian Head, and saturated the truck garden which is maintained there for the benefit of the officers and their families. The results were astonishing according to the Indian Head people. They grew vegetables which they declare vied in color and perfection with the choicest lithographed specimens which adorn the seed catalogues.

This year the experiment is being tried on a larger scale and with equal success on the gardens and lawns at Fort Hunt and Fort Washington, two of Washington's defenses down the Potomac. What might happen if officers should smoke on the parade grounds treated with the powder solution can only be guessed, but no one seems to be worrying about it. Meanwhile the conservative Agricultural Department looks on and applauds, but so far there has been no requisition on Indian Head for old powder for the experiment stations.

AIR-COOLED SPARK PLUGS

A spark plug described as "air cooled" has recently been placed on the market in Germany. Although differing little from the conventional pattern, this plug incorporates a distinct innovation, the central metal spindle, which carries the current to the interior of the cylinder, being bored for about three-quarters of its length, while at the point where the hole terminates are two small perforations which extend to the outside. These small holes provide an escape for the air which is drawn through the spindle. A check valve, housed in the brass cap of the plug, permits the free ingress of a certain amount of air on the suction stroke of the motor, but closes tightly to prevent the escape of gas during the working stroke. It is claimed that the air so admitted maintains the plug at a temperature considerably below that of the ordinary plug.



Air-Cooled Spark Plug Being Marketed in Germany

BUILDING STONE MADE OF BLAST-FURNACE SLAG

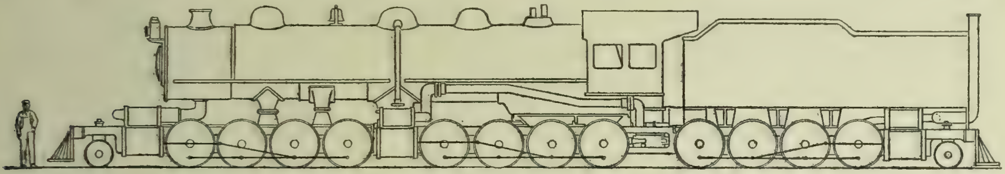
An industry now assuming considerable importance in Germany is the manufacture of building stone from blast-furnace slag. According to The Engineer, London, the process is not patented, and is very simple in details. Practically all blast-furnace slag is suitable for stone making, but it must be in a granulated state, being unsuitable after it has been allowed to harden. All attempts to utilize slag that has been crushed or ground, after having been once hardened, have failed to produce a good solid stone.

In the process here referred to, the slag is granulated by the addition of water as it flows hot from the furnace. The granulated slag is then, after being thoroughly mixed with the required proportion of lime, allowed to stand one hour before being put through the forming press. After being pressed the stones are slacked in the open air, and, after three or four weeks, according to the weather, they are ready for use. Under low temperature they harden slowly, and if subjected to frost before thoroughly hardening, they crumble and are ruined. Otherwise, the stones grow constantly harder with time.

¶Russian laws dealing with false weights are so severe that in one province merchants who violate the law are prohibited from participating in any kind of trade.

TRIPLEX COMPOUND LOCOMOTIVE

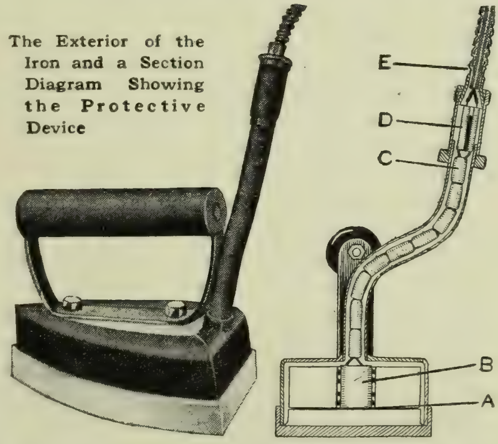
The design of a locomotive, which is practically an ordinary Mallet with working tender, but instead of having the high and low-pressure cylinders of different size, has a pair of high-pressure cylinders attached to the frames connected with the back part of the boiler, and two pairs of low-pressure cylinders, one in front and one at the rear of the tender, all the cylinders being of the same size, is shown in the accompanying illustration. With this arrangement a compounding ratio of two to one is obtained, and it is found that, with but a slight increase in the weight and cost, and without any increase in length, about 50 per cent more tractive effort is obtained, the working tender being so arranged that, with only 25 per cent of fuel and water remaining, there will be sufficient weight to give the full adhesion. The weight of such a tender with a 25-percent load would be over 100,000 lb.


A Proposed Triplex Compound Locomotive

The horizontal pipe with a ball joint in the cylinder saddle, which takes the exhaust from the high-pressure cylinders, has, according to the Railway Gazette, given practically no trouble in Mallets now in service, and this is simply duplicated in the rear of the new design by making a pocket with a ball joint in the footplate and taking the exhaust steam from the high-pressure cylinders back to this footplate, as well as forward to the front cylinders. The object of placing the cylinders on the tender at the rear end, is to make the swivel pipe, which has the ball joint in the footplate and which corresponds to the receiver pipe, connecting the high and low-pressure cylinders at the front of the engine, of suitable length.

HEAT PROTECTION FOR ELECTRIC FLATIRON

A new type of electric iron, designed especially to meet the severe conditions which obtain in laundries and dry-cleaning shops, is shown in the drawing. It is fitted with a special attachment arranged in such a manner that the combustible insulating covering of the flexible lead is protected at the points likely to become so hot that the insulation may be damaged. The two wires leading from the heating element A are brought into a porcelain connector, B, which consists of two solid-brass terminals imbedded in porcelain, the wires being held in position by setscrews, without soldering. These terminals are connected at the top by two copper wires, which are carried in iron tubing and are insulated by being threaded through small pieces of porcelain, C. These pieces of porcelain abut closely together, so that there is no possibility of the two leads accidentally becoming short-circuited. The two copper wires terminate in a second connector, D, to which the flexible lead E is attached.


The Exterior of the Iron and a Section Diagram Showing the Protective Device

CALCULATING THE CIRCUMFERENCE OF THE UNIVERSE

By FOREST RAY MOULTON

The diameter of the part of the physical universe which has been penetrated by the most powerful telescopes of modern times is about the distance light travels in 10,000 years. Now light travels 186,330 miles per second, there are 86,400 seconds in a day, and there are 365¼ days in a year. If the diameter of the universe were exactly known, would mathematicians be able to compute its circumference with an accuracy meeting all requirements? For example, could they compute it within 1/100,000th of an inch, so that the error in their results could not be detected with the most powerful microscopes in existence?

The approximate length of the circumference of a circle is obtained by multiplying its diameter by 3 1/7. This result is a little larger than the true value. A more nearly correct result is obtained by multiplying the diameter by 3.1416. While this result is exact enough for most engineering and other practical problems, the error would be important in computing the circumference of the universe. A still more nearly correct value of the multiplier is 3.14159265, which is accurate enough for all ordinary scientific purposes of the present time, but the reresults are not absolutely correct.

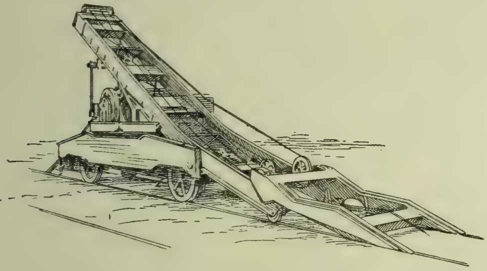
One may ask, then, what number should be used in order to get the exact circumference when the diameter is given. Mathematicians have proved that, unfortunately, the exact number can not be expressed by a finite number of figures, either as a decimal or as an ordinary fraction. If the number were expressible as an ordinary fraction, then, when it is reduced to the decimal form, it would be found that the same figures repeat themselves in the same order over and over again. For instance, if the number were 3 1/7, in the decimal form it would be written 3.142857, where the omitted part consists of the figures 142857 repeated over and over indefinitely. In a similar manner, every other number which can be expressed as an ordinary fraction goes into a decimal which contains a similar cycle, generally of fewer figures. The number 1/5 goes into a decimal whose repeating cycle is simply 0. Now, the number to be used to compute exactly the circumference of a circle cannot be expressed as an ordinary fraction or as a decimal which repeats in the manner indicated. Such numbers are called by mathematicians "transcendental numbers," and must be computed in detail as far as they are desired.

The number which must be used in finding the circumference of a circle from its diameter has been the object of much attention on the part of mathematicians and computers. It has been most exactly determined by W. Shanks, an Englishman, who computed it to 707 decimal places. This is not only far beyond the actual requirements of all science at the present time, but it seems certain that it will always remain so; for, it is found that if it were known only to 30 decimal places, the circumference of the universe could be computed with an accuracy so great that the error could not be detected with a microscope. Not only has the number been computed quite far enough, but mathematicians have wasted an enormous amount of time in getting the last 677 places.

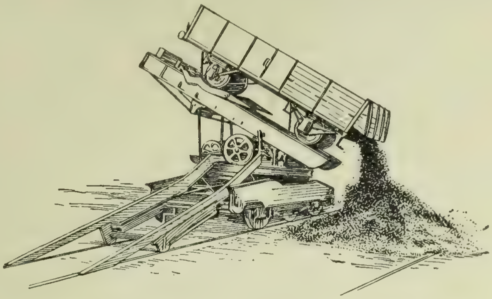
ℭHeadless safety matches have been manufactured for some time by a Danish match concern. One end of the little sticks of wood are dipped into a solution of chemicals for half a minute and then into water for a quarter of a minute. Like other safety matches, they cannot be ignited by friction in any way except against a specially prepared surface. The prepared end of the match is distinguished by being colored.

AN ELEVATING DEVICE FOR UNLOADING CARS

A car especially designed to elevate and dump cars loaded with coal, gravel, and like materials, is being used in Germany. It comprises a flatcar of especially strong construction, on which is mounted a turntable bearing rails. This turntable is capable of being swung completely around and can be tipped to an angle of 45 deg. Normally it is inclined at an angle of 30 deg., so as to form an unbroken line with the approaches on which the cars are drawn onto the turntable for unloading and are run from it after the operation. Cables, driven by a motor, draw a car at a time onto the turntable, the turntable is given a quarter turn, its inclination is increased from 30 to 45 deg., and the load is allowed to discharge from the end of the car. Then the turntable is lowered again to the 30-deg. inclination, turned another quarter-revolution, and the empty car run off the table on a second set of approach rails. The operation of the turntable is executed by means of a second motor.



A Car for Elevating and Unloading Gondola Cars

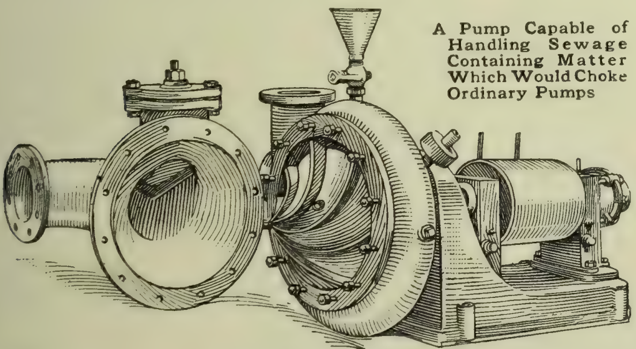


A Car Inclined by the Elevator and Discharging Its Load

The idea is to provide each long coal train with an unloading device. It will elevate and unload six to eight cars an hour with ease.

PUMP DESIGNED SPECIALLY FOR SEWAGE

One of the greatest difficulties encountered in pumping sewage arises from the fact that great quantities of solid matter find their way into drainage systems, this matter often being of such nature as to interfere with the working of the ordinary reciprocating and centrifugal pumps. Recently, however, a pump has been invented by an English engineer, which, it is claimed, will handle unscreened sewage of a consistency that would choke any other type of pump. It is a special form of centrifugal pump described as "an eater of solids." It is claimed to have an efficiency approximating that of the ordinary centrifugal pump. From the illustration it may be seen that the pump consists of a centrifugal with a conical impeller, the discharge being from a whirlpool chamber of gradually increasing size, as is usual. The impeller is provided with a number of spiral blades running out of the top of the cone, and is carried on a hor-



A Pump Capable of Handling Sewage Containing Matter Which Would Choke Ordinary Pumps izontal shaft provided with a long bearing, and also with the necessary thrust bearing. Unlike the outflow from the ordinary centrifugal, the fluid forced through the pump does not leave the impeller at right angles to the spindle, but in a direction corresponding to the taper of the conical impeller.

LETTERS STAMPED WITH INK INSTEAD OF STAMPS

The latest type of slot machine for stamping letters to be tried in London does not stick the ordinary postage stamp on the letter but stamps the letter in the same manner as the stamping machines used in a postoffice to cancel stamps. That is, when the sender inserts his letter in the machine, and places a penny in the slot, the envelope is impressed with a circle of red bearing the words "London, 1d. [one penny] postage paid," and also with the numerals designating the section of London in which the letter was stamped.

An English Postage Slot Machine Which Stamps a Letter with Ink Instead of Sticking the Usual Postage Stamp Upon It

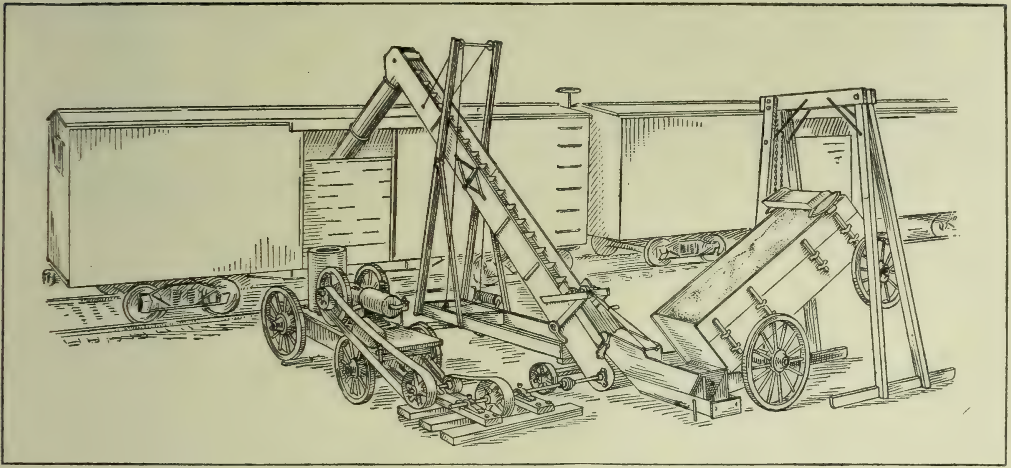
ℭThe river Amazon, according to the United States Geological Survey, carries to the Atlantic Ocean 618,000,000 tons of solution and sediment, traces of which can be observed 100 miles from land.

NEW GERMAN CANAL PROPOSED

A number of the Chambers of Commerce and influential manufacturers of Germany are advocating the construction of a canal through German territory from the Rhine to a German port on the North Sea. The commission which has been intrusted with the negotiations and plans proposes that the canal start from the Rhine at Wesel, thence run in a northerly direction between the Netherlands frontier and the river Ems and finally join this river opposite the town of Leer, a few miles from the mouth. The length of such a canal would be about 120 miles. In addition to the great advantage to German shipping and the immense strategical value, the canal would also facilitate the cultivation of the fens through which it would pass.

ABSORPTION BY GLASS IN X-RAY PHOTOGRAPHY

One of the chief reasons why X-ray photographs have poorly defined outlines is that the glass ordinarily used in X-ray apparatus absorbs as high as 52 to 70 per cent of the rays, according to its thickness. Sir J. J. Thomson, the noted British scientist, has advanced the theory that the absorption is directly proportional to the atomic weights of the substances entering into the composition of the glass. Working upon this basis, German chemists have now produced a glass which absorbs only 10 to 15 per cent of the X-rays, scarcely becomes heated or fluorescent, and produces no secondary rays. The X-ray photographs taken with apparatus in which tubes of this glass were used, are said to be very clear and distinct. Also, much shorter exposures are needed.



Loading Grain into Cars by Means of a Portable Elevator

PORTABLE GRAIN-LOADING ELEVATOR

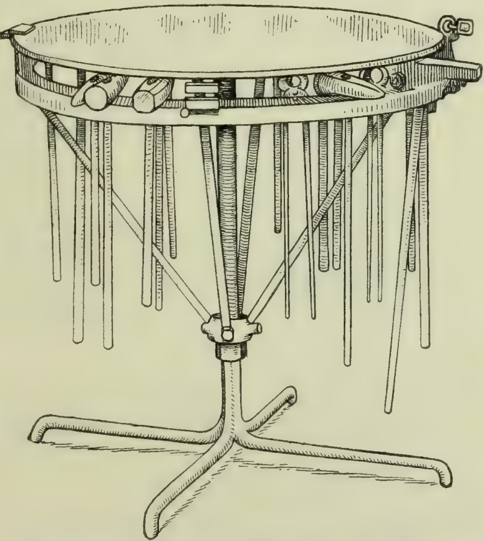
Several portable grain-loading elevators, which may be operated by an electric motor or by a gasoline engine, are being used with considerable success by the Northern Illinois Electric Railway, which devotes special attention to the handling of grain on its line extending through the famous cornbelt of Illinois. Regulation steam-road freight cars, operated on the electric line, are placed on sidings, located at frequent intervals, and the farmers bring the grain to them in wagons.

The first of the elevators used was driven by a gasoline engine, but the lately installed similar machines are operated by electric motors, taking current from the trolley wire. The grain wagons are tilted in the manner shown, and the load feeds into the receiving box of the elevator. A wagonload of grain can be transferred into a car in 10 min.

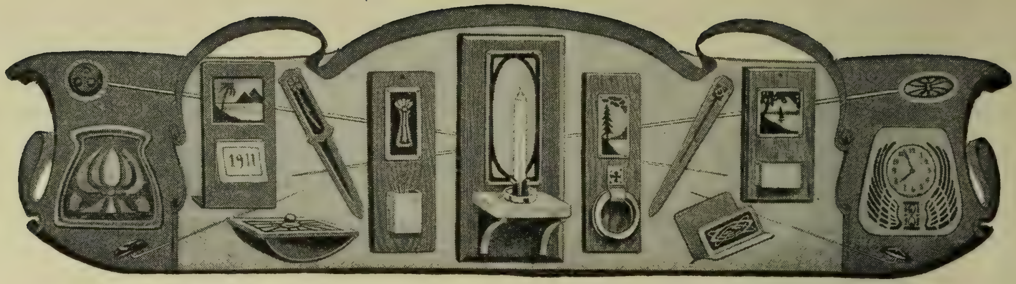
¶A traveler recently returned from China states he was astounded to learn that people in the interior who can speak no language but Chinese are yet thoroughly familiar with the life and work of George Washington, excellent biographies and reviews of his achievements having been published in Chinese.

THIEF-PROOF RACK FOR TOOLS

A stand tool rack provided with a means for preventing the mysterious disappearance of shop tools is shown in the accompanying drawing. The larger tools are held in the circular rack by dropping the handles through the slots, and in the center is a shallow tray for smaller tools. The tools are locked in place by swinging a large circular steel cover over them and padlocking it.



A Tool Rack Provided with a Top Which is Padlocked Over the Heads of the Tools to Prevent Their Removal



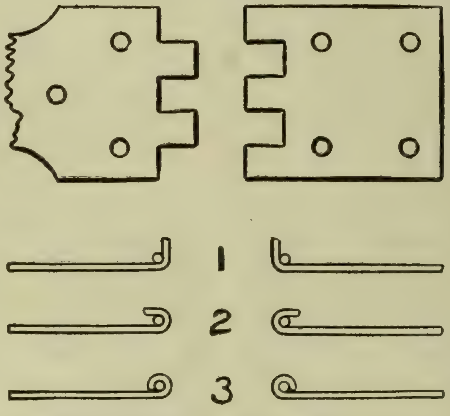
METAL WORK AND ETCHING

By JOHN D. ADAMS

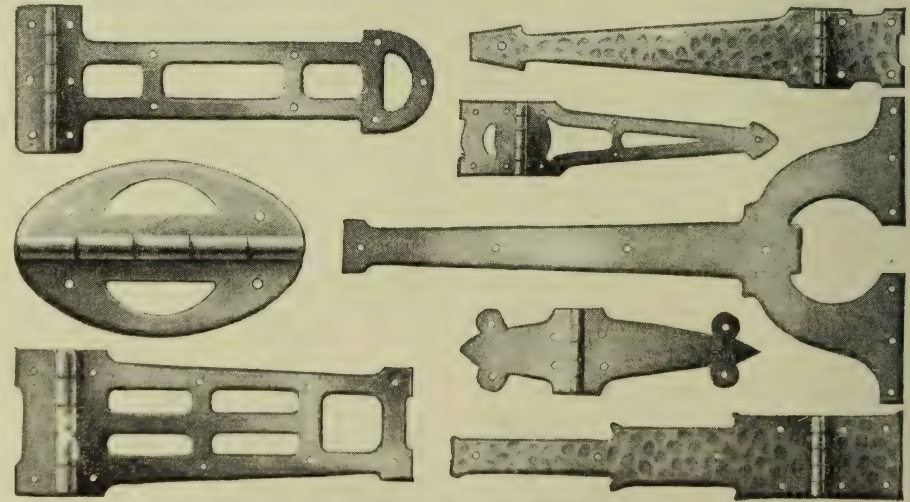
PART X—Hinges and Drawer Pulls

THE making of arts-and-crafts furniture is now an important item in all manual training courses, and is probably one of the most popular of handicrafts among amateurs in general. This class of furniture demands a distinctive style of hardware. In fact, in the absence of the usual machine-made ornaments, the hardware is about the only added decorative feature.

The accompanying illustrations may serve to point out what can be done in the way of hinges—either real or imitation. The latter, used in connection with butt hinges, are merely plates of brass or copper appropriately shaped and attached with large-headed nails. In making the real hinge, we must first make an accurate full-size drawing, showing the pattern and the projecting lugs as in the working drawing. As a rule, three of these are integral with the stationary portion, and the remaining two form a part of the swinging half.

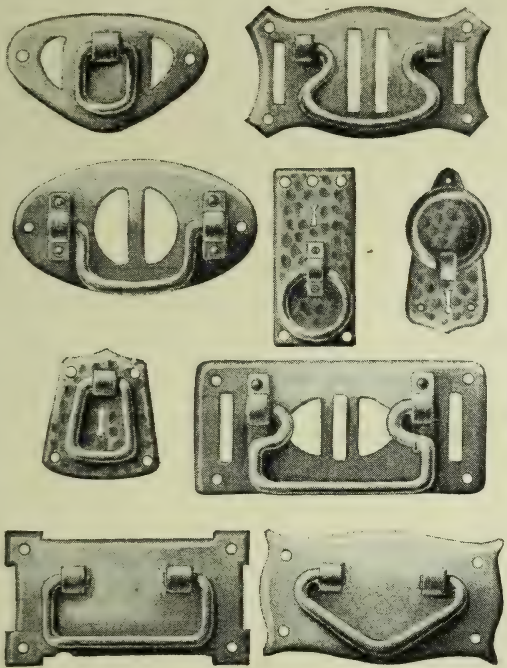


Hinge Patterns and Stages of Construction

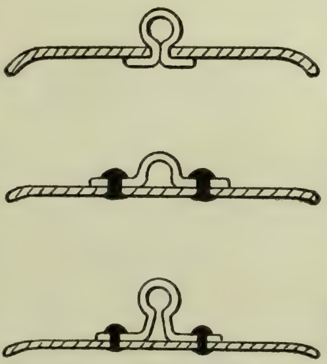


Artistic Designs for Hinges

With thin metal, say, No. 20 gauge, the piece may be cut out with the tin snips, but for the heavier gauges the saw must be used. Where portions are to be cut from the interior, a hole must first be drilled so that the saw blade can be inserted. A short piece of board, 3 in. wide, with a notch in the end, should be nailed or clamped to the bench, so as to overhang about 4 or 5 in. This will prove a great convenience when sawing, as it will firmly support the metal while the saw is moved up and down through the slot. Place the saw in the frame so as to cut on the down stroke. On the larger hinges and where the shape will permit, the edges should be bent over slightly with the hammer, so as to give the appearance of thickness. When the projecting lugs are all filed up square and properly fitted, the bending should be done. The various stages are indicated in the drawing. After stage two has been reached, a straight wire nail should be inserted and the piece hammered closely around it. Some further filing will then be necessary in order to get the two sides to fit properly together. This accomplished, however, nothing more remains than to fit in the pin and trim off its ends, which should then be slightly burred to prevent it from falling out. The wire nail used in forming the lugs may serve as a pin, provided it is perfectly straight and the head is cut off.



Designs for Drawer Pulls



Cross-Sections Showing Construction of Drawer Pulls

The etching process is rarely applied to hinges, but the several coloring solutions, heretofore described, may be applied according to the effect desired. Plain lemon brass and hammered copper are popular finishes. Lacquer is used in all cases.

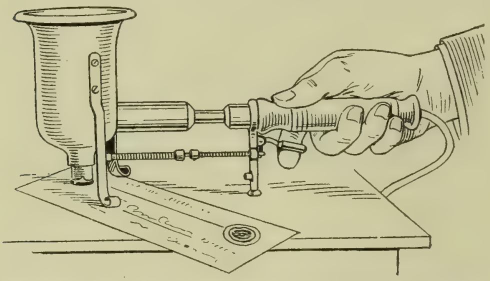
Drawer Pulls

There is probably no article within the scope of home metal work, in the making of which the efforts of the amateur show up to better advantage than in the case of arts-and-crafts drawer pulls. From the illustration of nine specimens some idea may be gained of the variety obtainable; and, as both brass and copper are available, and these in various finishes, the artistic possibilities will be evident. A piece of mission furniture of pleasing design, though made by an amateur and from pine lumber, will, when properly stained and fitted with this handmade hardware, present an attractive appearance.

The gauge of the metal may be about No. 16 for average sizes. When it is desired to keep the piece perfectly flat, all the cutting should be done with the metal saw. Interior openings require the drilling of a hole for the insertion of the saw blade, the end of which is then reconnected to its frame. The handles are of brass or copper rod, bent over wood and using a wooden mallet, so as to avoid marring them. These are connected to the plate by either of three methods, as shown. In the first method, the metal strip is first snugly bent around the handle and then the two ends are inserted into the small rectangular opening in the plate, where the ends are bent over and hammered flat. In the second method, a plain riveted strap is used. In the third, the strap is closely fitted around the handle and the two ends spread apart and drilled for the rivets. Where the size and pattern permit, the edges of the plate are to be beveled over with the mallet so as to give the plate the appearance of having considerable thickness. If the pulls are to be used in connection with the hinges previously described, the finish and metal should, of course, be the same.

ELECTRIC WAX MELTER AND DROPPER

An electric device for melting and dropping the wax used in sealing letters or packages is being marketed by an electrical concern in Buffalo, N. Y.



Wax Melter and Dropper for Putting Seals on Letters and Packages

It is designed especially for banks, express offices and shippers of large numbers of packages that require a wax seal, and is much cleaner and quicker than the old methods.

COATING IRON PIPES WITH LEAD

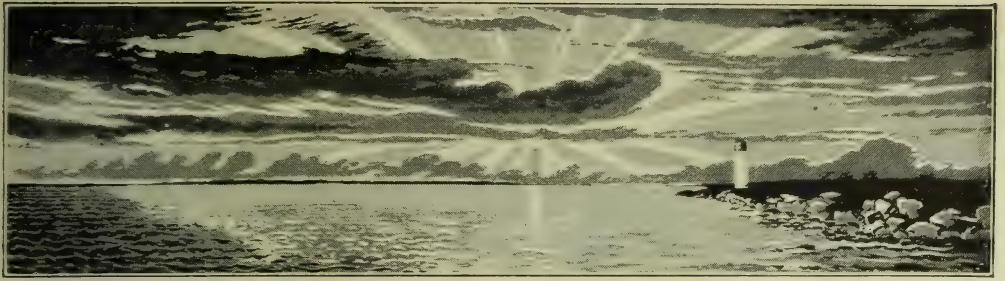
An English inventor has developed a new and cheap process by means of which a coating of lead of any thickness desired may be applied to iron. The weight of lead deposited can be varied from a fraction of an ounce to any weight up to several pounds per foot of surface. His process enables the coating to be applied to a variety of purposes, such as the lining of iron pipes, inside, outside, or both, used for the conveyance of corrosive liquids; the lining of pumps, chemical vessels, etc.

Hitherto the coating of iron and steel surfaces with lead has been almost exclusively confined to the production of terneplate, as the thickness of lead which could be applied was within narrow limits.

COALING BARGE MIXES THE COAL AUTOMATICALLY

Economy in the steamship consumption of coal often requires that two kinds of coal be mixed in a certain fixed proportion, and to expedite coaling under such requirements a concern in Liverpool, England, has constructed several automatic coaling barges which mix two classes of coal in different proportions as required. In these barges an endless chain of buckets runs over and under the coal compartments, receiving coal as they pass under the compartments. The doors in the bottom of the compartments through which the coal drops into the buckets can be opened or shut instantaneously by operation from the deck. The coal undergoes an automatic mixing process in its progress through the compartments to the doors, and then the mixing process is made complete as the coal from the buckets passes through the chutes into a steamship's bunkers.

Ⅽ The long-distance balloon record has been awarded by the Aero Club of France to Emile Dubonnet, for a flight of 1,214 miles.



The Wonders of Light

By J. GORDON OGDEN, Ph. D.

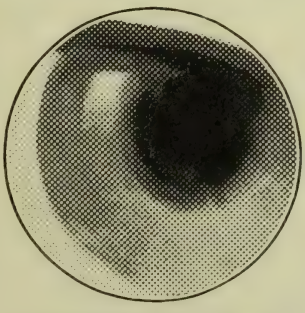
V — Vision

This is the fifth of a series of articles by the author of "Heat" and "The Kingdom of Dust," which have appeared in this Magazine. Dr. Ogden is professor of physics in the Fifth Avenue High School, Pittsburg, Pa.

LIKE every other function of the higher organisms, vision is a product of evolution. When we study the complicated parts and highly specialized mechanism of the human eye, we have only to turn to the seeing apparatus of the lower animals to perceive the beginnings of structures that reach their highest development in "the heir of all the ages, in the foremost files of time."

According to the Theory of Mosaic Vision, Each of the Visual Rods in the Retina of the Eye Takes Up a Part of the Object Which We See, the Whole Being Blended Together

Life existed on this planet for myriads of centuries in total blindness. Formless masses of protoplasm in the slimy ooze of ancient oceans moved to and fro on the ocean bottom, without a vestige of an organ of vision. As we go down the steps of animal life as we know it to-day, one by one the marvelous differentiation, or setting apart, of certain portions of the organism for the purpose of vision disappear. Finally, in the very lowest forms of life, in the remotest and deepest subcellar of creation, down at the bottom of the steps, we come to those curious beginnings of life—mere splotches of protoplasm, barely within the confines of living matter, and absolutely without visual apparatus. At least, the highest powers of the microscope fail to reveal anything of the kind.



An Enlarged View of the Engraving of the Eye Shown Aoove. Dots cannot be Seen in Top View, but are Very Plain in Lower. This is a Fine Illustration of the Mosaic Theory

For ages the beating of light waves upon these primitive smears of life had no effect other than that of, possibly, a slight stimulation on the rudimentary nervous system. Finally, through all the æons of time that our earth has been in existence, this constant pounding on the closed doors of sense perception had its effect. The first eye to open could hardly be called an eye. A tiny speck of pigment appeared whose special function seemed to be that of responding to the incessant summons of the light waves. In Euglena, Fig. 1, a microscopic animal that gives a greenish color to the pools of water that it inhabits, appears a tiny "eye spot" that seems to be the humble beginning of an organ designed for vision alone. It is the first step on the way to the development of a sense that gives to the living world the faculty of sight.

No one knows how many ages, how many cycles of time, elapsed before the human eye with its marvelous lens and magic retina made possible the glories of the rainbow, the wondrous colors of a sunset, and all the other beautiful phenomena attendant upon the tiny ether waves known as light.

It is quite probable that all eyeless animals have the power of distinguishing light from darkness. The maggots from which the common housefly originates will wriggle away from light and seek refuge in the darkest crannies. The hydra (Fig. 2), a tiny, green or yellow, fresh-water polyp, if placed in a black bottle filled with water, will attach itself to any part of the glass where the light may filter through. Even a plant will turn toward the light, as everyone knows who has observed a potato or geranium growing in a cellar window. This, however, is not vision. A picture-forming eye must have a lens in order that the light rays may be concentrated. Some form of nerve tissue is also needed in order that the light's tiny quiverings may be perceived.

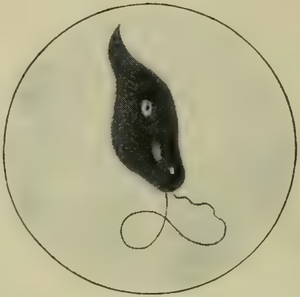


Fig. 1—Euglena, Microscopic Animal with "Eye Spot"

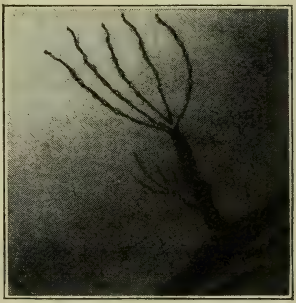


Fig. 2—The Hydra, Low Form of Life Turning toward Light

The crayfish, commonly known as the "crawfish," has a wonderfully complex visual equipment. The two eyes possessed by this humble invertebrate, are really compound eyes. Figure 3 represents a vertical section of the eye stalk of the crayfish, and Fig. 4, a highly magnified portion of the same stalk, showing the cones, spindles, and optic nerve. Each of the paddle-shaped crystalline cones is an eye in itself, separated from all the other eyes by a dark zone of pigment. These cones are not hollow tubes. On the contrary, they are solid rods of high refractive power. As many images are borne to the central nervous system of the crayfish as there are individual visual rods. Does the crayfish, therefore, see multiplied images of an object? When an enemy or friend approaches, does it see a legion of its acquaintances, and is its whole horizon taken up with tiny pictures of its casual callers?

When we consider that the common ant has 100 such eyes; the housefly 8,000, and the dragonfly, 28,000, the question of compound vision is interesting, to say the least. No wonder that a fly is so elusive with its tremendous battery of eyes, giving a range of vision through a very wide angle.

It is quite likely, as demonstrated by Johannes Müller, that compound eyes do not play the part of simple eyes. Each of the 8,000 images or pictures formed by the facets of a housefly's eyes is not an image of an entire object, but only of a part. These parts are fitted together in somewhat the same manner as the irregular bits of colored glass and stone are harmonized into the beautiful mosaic pictures of mediæval Italy. Figure 7 shows very clearly the principle of mosaic vision. Only a few rays of light from any point on an object can reach the optic nerve, and these rays must enter perpendicularly to the cornea. Hence, there is little or no confusion of images, and each point in an object occupies the same relative position in the mosaic image thus formed.

The human eye, Fig. 8, while it appears to be quite different from the compound eye of the crayfish, has a fundamental resemblance to it, as Huxley has pointed out. In order that we may understand what is really a close relationship, let us review, briefly, the structure of the vertebrate eye, especially that of man.

A human eye is like a camera. It has a lens to gather the light rays to a focus. It has an adjustable screen, or iris, for regulating the amount of light that shall enter. It has a sensitive film affected by the physical or chemical action of the light. Like the camera and all other optical instruments, its interior is dark and lined with black, in order that there may be no unwanted internal reflections with consequent multiplied images. Again, unlike the camera, the eye does not depend upon the lens alone for its light concentration, for the thin, transparent skin which covers the pupil, and is known as the cornea, has also the power of refraction. Furthermore, two fluids in the eye, one in the front, known as the aqueous humor, and one in the main chamber, known as the vitreous humor and occupying about four-fifths of the bulk of the eye, have likewise the power of bending the light rays that pass through them. All of these refractive media work in conjunction, with each other and with the various muscles and nerves, to produce a sharp, clean-cut image upon the retina.

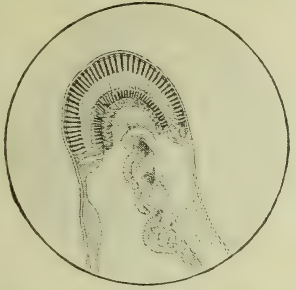
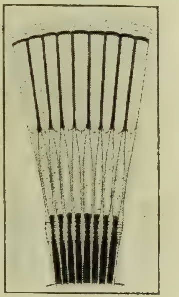


Fig. 3 (Upper View) — Magnified Vertical Section of Eye Stalk of Crayfish

Fig. 4 (Lower View)—Highly Magnified Portion of Same Stalk, Showing Cones and Spindles



The retina, shown in cross section in Fig. 9, is, perhaps, the most complicated, the most marvelous, of all of nature's handiwork. It is the apex of the pyramid of creation. The retina of the human eye, although it is but one-eightieth of an inch in thickness, is made up of 10 distinct layers, each of which has some distinct function in the business of the eye—that of receiving the rays of light, permitting them to make certain, probably, chemical changes, and transmitting the effect to the brain.

While physiologists are not of one accord as to the effect of light waves upon the retina, it is generally admitted that the ninth layer, which is made up of rods and cones, has a most important part in the mechanics of vision. The retina is really a network of almost immeasurably small branches of the optic nerve. It is made up of delicate nerve fibers, numbering no less than 800,000. For each fiber there are seven cones, 100 rods, and seven pigment cells. Let the reader multiply the numbers of fibers, cones, rods, and pigment cells, and call to mind that this myriad of complex structures are packed into a space less than one-fivehundredth part of an inch in thickness, and he will gain some idea of the wonderfully intricate construction of the apparatus which serves the priceless gift of sight.

To gain a better conception of the rods and cones, and their functions, let us quote from Professor Bidwell, an English scientist of note: "Imagine a small portion of the inner surface of the eyeball, one-tenth of an inch square, to be magnified 2,000 diameters (four million times), and let the enlarged area be represented by a floor of a room, 17 ft. square. Procure a quantity of cedar pencils, and set them on the floor in an upright position and very close to one another. It will be found that the number of pencils required to fill the space will be about half a million. To make the analogy more complete, let some of the pencils be sharpened to a long tapering point at their lower ends, the greater number remaining uncut, just as received from the manufacturers. Neglecting details, which may be regarded as immaterial for our present purpose, we may consider the uncut points as representing, upon an enormously magnified scale, the rods of the retina, and the pointed ones, the cones. The flat upper ends of the pencils may be painted in different uniform colors, and arranged so as to form a large picture in mosaic; if this is looked at from such a distance that its image is a tenth of an inch square (which will be the case when the picture is about 40 yd. away), all possibility of distinguishing the separate elements which comprise it will be lost, and the picture will seem to be a perfectly continuous one. Although the light which enters the eye cannot reach the rods and cones until it has traversed all the other layers of the retina, yet these intervening layers, being transparent, offer little obstruction to its passage, and it can hardly be doubted that the rods and cones are the special organs upon which light exerts its action, the picture focused upon their ends being in truth an exceedingly fine mosaic."

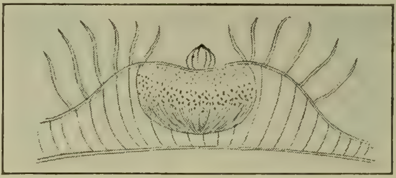


Fig. 5—Magnified View of Section of Simple Eye of Jellyfish

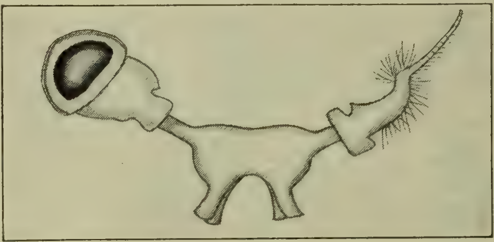


Fig. 6—Eye Stalks of a Decapod. The Compound Eye on the Right has been Lost, and in Its Place the Animal has Regenerated an Antenna—*After Herbst*

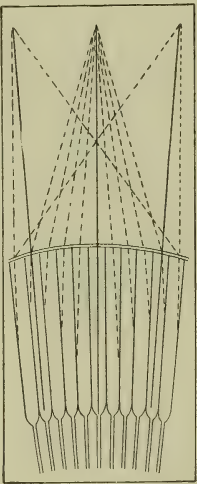


Fig. 7—Diagram Showing the Theory of Mosaic Vision. Practically Only One Ray of Light from Any Point may Enter the Visual Rods, Which are Supposed to be Hollow Tubes

There are various theories concerning what takes place when the ether waves enter the rods and cones. Some scientists hold the opinion that the energy of the light waves is transformed into electrical energy, and that the visual stimulus is electrical. Others believe in the photo-mechanical theory, according to which the pigmented cells in the retina, forced out of their shape and volume by the mechanical action of light, press upon the rods and cones, thus producing a stimulation.

The most probable theory, however, is that which is known as the photo-chemical. According to this theory the light waves produce a chemical change in the rods and cones, causing impulses which ascend the optic nerve to the brain. There is, in the retina, a peculiar substance known as rhodopsin or "visual purple." It bleaches under the influence of strong light, but is regenerated quite rapidly. Boll, its discoverer, claimed that this vision purple furnishes absolute proof of the photo-chemical theory of vision. The elaborate researches of Kühne have weakened this belief considerably. The function of the purple seems to be that of rendering the eye sensitive to very faint light. All nocturnal animals, with the exception of the bat, possess this peculiar compound to a marked degree.

The photo-chemical function of the purple is shown in Fig. 10. If the strong light from a barred window is permitted to fall upon the retina of a rabbit, the eye quickly removed, and the retina "fixed" with a solution of alum, the purple will show the barred effect portrayed in the illustration, a permanent "photogram." In the center of the retina, quite near to the optic axis, is the "yellow spot," the most sensitive area of the eye. In the center of the "yellow spot" the rods are absent. About a tenth of an inch from this point, the optic nerve enters the eye, and the retina is incomplete in this area, forming what is known as the "blind spot." Figure 11 affords an opportunity of demonstrating the existence of the "blind spot," if the directions under the illustration are faithfully obeyed.

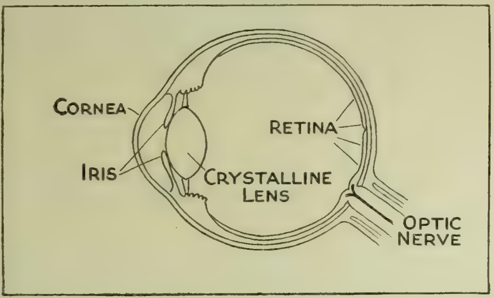


Fig. 8—The Human Eye, Normal Vision, Showing All the Important Parts

Man's eye is an improvement upon those of the lower forms of animal life, but it is by no means a new thing under the sun. As before noted, Huxley has called attention to the fact that it is not such a far cry from the wonderful eye of man to the equally wonderful eye of the crayfish.

It is quite likely that the human eye is at present in a transitional stage of development; otherwise it would be difficult to account for its many defects as an optical instrument, unless we choose to regard these defects as the results of compromises whereby the best average results are obtained.

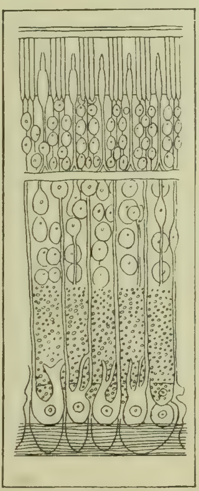


Fig. 9—Cross Section of Human Retina. Note Rods and Cones in the Upper Layer

An exposition of a few of these defects may not be uninteresting. For example, no human eye has any adequate means for the proper correction of what is known as "chromatic aberration" or, in plain language, it lacks the power of bringing all colors to the same focus. Were the eye corrected for this defect, vision would be clearer. One would not see the violet haze around the opal globes of the arc light in the streets. A red spot upon a violet ground would not appear to be raised above the surface, nor would a violet spot upon a red ground appear to be depressed, if the eye brought all the colors to the same focus. A room that is papered or painted a blue-violet color appears to be larger than when its coloring is red. This is likewise a result of chromatic aberration.

Another defect of the eye is known as astigmatism. As the term is ordinarily used, astigmatism is caused by an irregularity in the curvature of the cornea. The

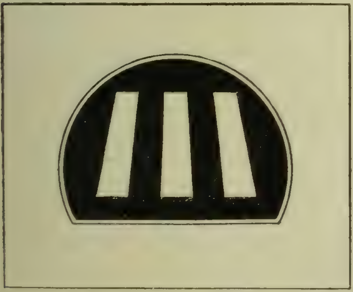


Fig. 10—"Photogram," Showing the Effect Produced on the Visual Purple of the Retina of a Rabbit, by the Action of a Strong Light from a Barred Window

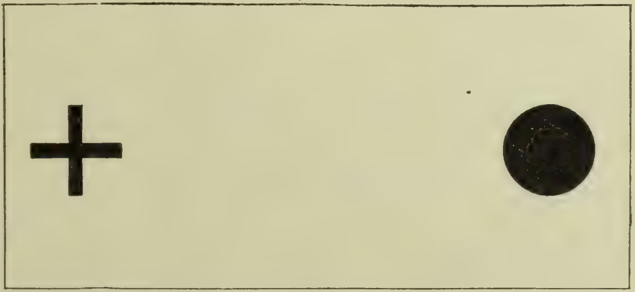


Fig. 11—The Blind Spot. Close the Left Eye. Look Steadily at the Cross. A Position can be Found, by Moving the Book toward or from You, Where the Circle will Disappear. The Image of the Circle is Then on the "Blind Spot"

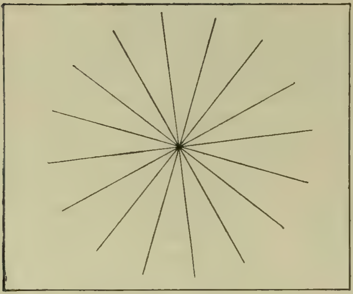


Fig. 12—These Lines are All of the Same Degree of Blackness. They Do not Appear so to an Eye Afflicted with Astigmatism

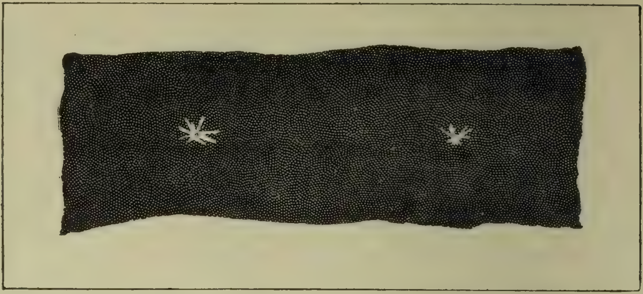


Fig. 13—Irregular Astigmatism. This Peculiar Effect may be Perceived by Looking at a Light through a Minute Circular Hole in a Piece of Tinfoil

cornea is shaped more or less like the bowl of a spoon, its curvature being greater vertically than horizontally. As a result the eye is unable to bring to a sharp focus all the parts of two lines crossing each other at right angles. One line generally appears to be heavy and distinct, while the other has a slightly hazy appearance. This form of astigmatism as revealed by Fig. 12 may be corrected by the use of cylindrical glasses.

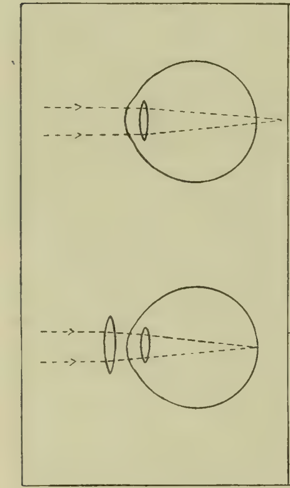


Fig. 14

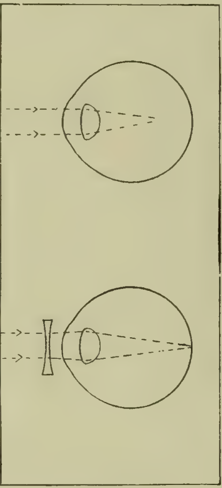


Fig. 15

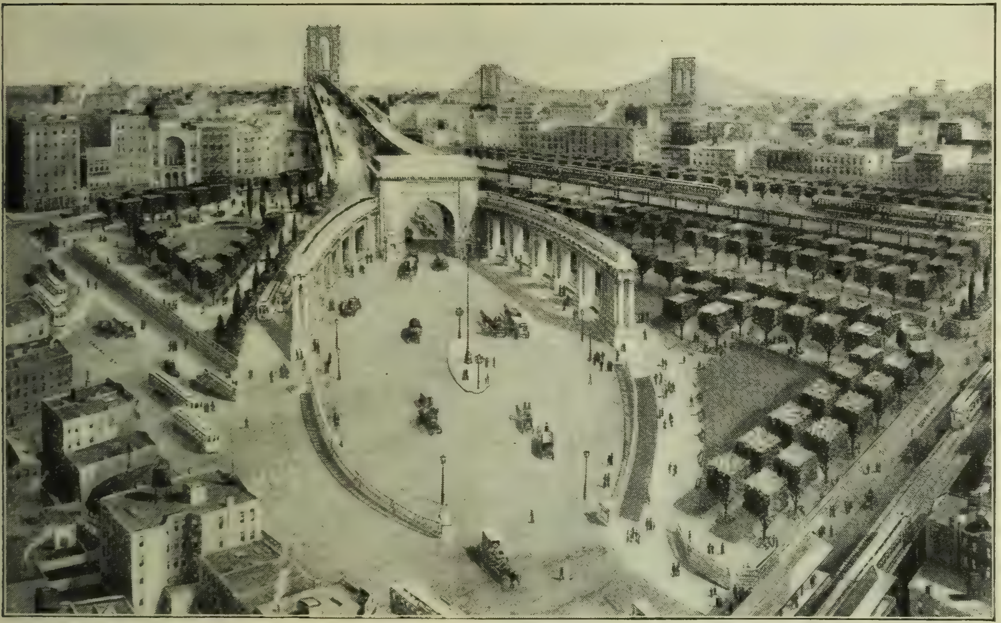
Fig. 14—"Far Sight," Due to Flattening of Crystalline Lens. The Lower Drawing Shows How This Defect may be Remedied with the Lens of Eyeglasses

Fig. 15—"Short Sight," Due to Extreme Curvature of Crystalline Lens. The Lower Drawing Shows How This Defect may be Remedied with Convex-Lens Eyeglasses

There is another form of astigmatism, however, that cannot be corrected. It is known as "irregular" astigmatism, and practically every man, woman, and child is a victim of it. Fortunately, it is not of much importance and bothers no one, unless it is very marked. It is usually due to the peculiar construction of the crystalline lens, in that this important part of the eye is not of the same density throughout, but is made up of a number of separate portions of different densities, pieced together. In other cases it may depend upon irregularities in the curvature of the cornea. The demonstration of irregular astigmatism is a very simple matter. With a fine needle, pierce a small, circular hole in a bit of tinfoil. Close one eye, and with the other, look at a bright light through the hole in the foil, keeping the foil about ten inches from the eye. The hole will not appear to be circular, but jagged and uneven. If you bring the foil an inch or two nearer, the hole will appear to be star-like in form, as shown in Fig. 13. Irregular astigmatism is responsible for the "star-like" appearance of the stars in the heavens, as with perfect vision, the stars would be simply luminous points, devoid of the "rays" that appear to emanate from them.

Other defects of vision are the familiar "far-sight" and "short-sight." They are generally ascribed to a congenital shortening of the whole eyeball, in the case of farsightedness in young people, and an elongation of the whole eyeball in myopes. Far-sight, in old people, again is ascribed to flattening of the lens, caused by hardening and contraction thereof; which phenomenon also takes place in myopic people, so that the far-sighted require convex lenses of increasing strength, while myopes require concave lenses of decreasing strength, and sometimes, in old age, have to use convex lenses. The application of suitable lenses for the correction of these defects is shown in Figs. 14 and 15.

Let us hope that in spite of the obvious misuse of our eyes, and the tendency to over-light our homes with the advent of cheaper and more powerful artificial illumination, the coming man will take better care of the "windows of his soul."



Beautiful Plaza Design Planned for New York End of Manhattan Bridge, Connecting New York City Proper with Brooklyn

THE PLAZA PLANNED FOR MANHATTAN BRIDGE

The plan for the Manhattan Bridge plaza, New York, is probably the most artistic treatment of a bridge entrance that has yet been attempted on this continent. In Europe such plazas have been given a great deal of attention, but up to the present time, with few exceptions, such artistic features have been neglected in America. The archway is somewhat similar to the arch at Porte St. Denis, Paris, and the treatment of it suggests the Arc de Triomphe. The elliptical effect will remind those who have been in Rome of the colonnade at St. Peter's.

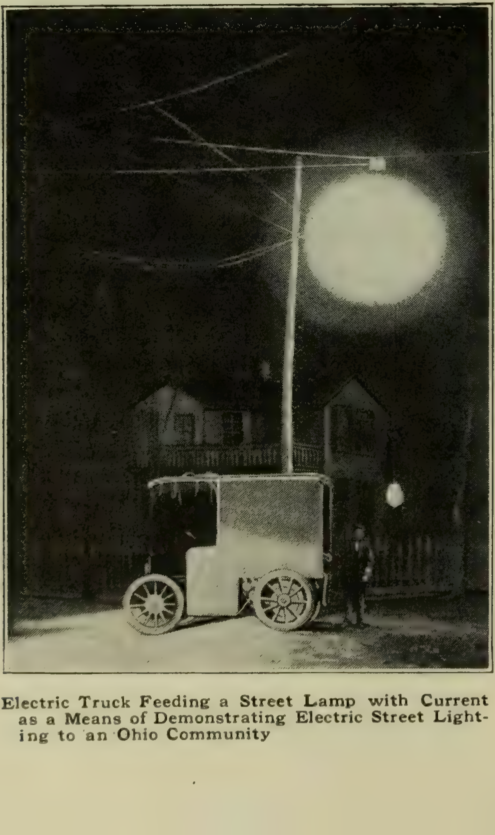
The details of the plan call for sidewalks laid out with warm-colored mosaics and crossings lined off in similar manner, which will add much to the appearance of the plaza. The plaza parks are planned to be raised above the adjoining streets to a height of from 5 to 8 ft., surrounded by granite walls with granite balustrades. Steps will lead up to the park space at several points. The main walks through the parks to the entrance of the bridge will be of bluestone flagging and the pathways of white pebbles.

The transportation facilities of the plaza were made the subject of much study, the architects and the engineers constantly coöperating. Subway trains coming off the bridge on the lower four tracks will pass directly under the plaza and directly under the arch. The surface cars, which are shown on the easterly or upstream side of the bridge, pass around the colonnade to the east and are taken to Canal Street. The illustration shows the westerly or downstream tracks placed on the upper deck devoted to elevated-train service. This is merely an alternative treatment to show how this connection can be made. The original plan showed a terminal building here for the Brooklyn surface lines, and the plaza has been treated so that it will be in harmony with either scheme.

ELECTRIC TRUCK AS STREET-LIGHTING DEMONSTRATOR

That the electric truck can be used with success as a demonstrator of street electric lighting has been shown by the contract department of the electric company furnishing Dayton, Ohio, with illumination. Also, it puts street illumination in the same class as commodities that are directly demonstrable.

Trotwood, Ohio, a little city eight miles north of Dayton, became interested in electric street lighting, and the Dayton company, on learning this, planned a demonstration to show the people of the community just how the proposed illumination would look. A standard 60-cp., 75-watt series tungsten lamp was hung from a corner span rigged up for the purpose, and one of the company's electric trucks was driven over to Trotwood and its batteries were connected up to the lamp. This ingenious demonstration proved so successful that the Dayton company received a 25-year franchise, a 10-year street-lighting contract, and a pumping contract.



Electric Truck Feeding a Street Lamp with Current as a Means of Demonstrating Electric Street Lighting to an Ohio Community

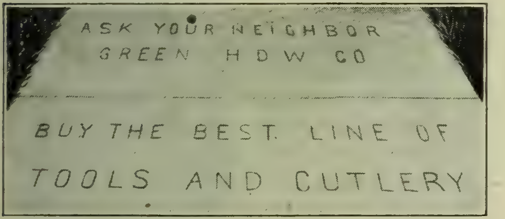
ELECTRICALLY OPERATED GAS METER

One of the large electrical manufacturing companies is making a gas meter, based on a principle quite different from that of the ordinary meter. In this meter the gas passing through it is heated, by an electrical heating unit, through a fixed small temperature range, usually about 2 deg. Fahr., and the electrical energy required to produce the change in temperature provides a measurement of the flow of gas through the meter.

The difference in temperature of the gas, before and after it passes the heating element, is controlled and kept constant by means of two resistance-thermometer screens which are placed on opposite sides of the heating element. The electrical energy required to raise the temperature of the gas a predetermined value is directly proportional to the mass of gas flowing through the meter, regardless of its temperature, pressure or volume. The energy input to the heating element is recorded on a watt-hour meter, or any suitable watt-meter, which can be calibrated directly in cubic feet of gas at a standard condition of temperature and pressure. It is found that about 1 kw. hour is required for each 75,000 cu. ft. of gas passing through the meter.

TOWN SELLS CEMENT WALK FOR ADVERTISING

Wishing to extend a cement sidewalk a distance of three or four blocks to the new fair ground, and having no fund for the purpose, the town of Hope, Arkansas, constructed the extension by selling each outlined block of it as advertising space. A plat was made of the walk, showing it divided into numbered squares. A few of the squares were retained, on which to place a short history of the town, giving names of prominent men, various industries, population at different dates, and the names of county and town officers at the time, and the remainder were sold for advertising.

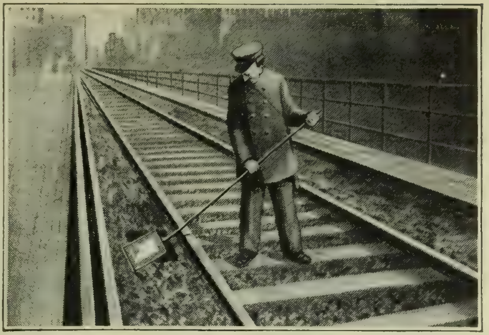


A Section of Cement Sidewalk in Hope, Arkansas, was Paid for by Selling It as Advertising Space

In most cases the advertising was done by forming the letters in the top coat before the final set, but a few of the advertisers furnished aluminum letters and numerals, about 3 in. high. Although the sidewalk has now been laid for some time, the outlines of the letters are said to be as when first made.

LOOKING-GLASS AS RAILWAY TRACKMAN'S TOOL

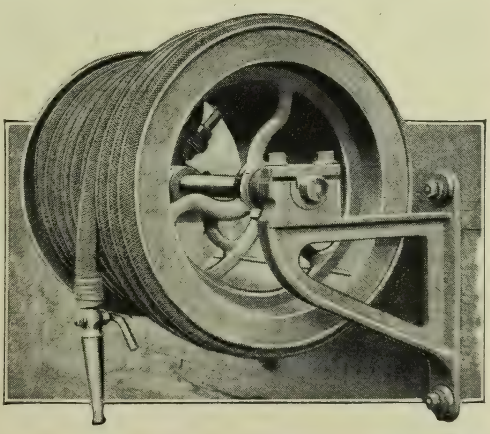
A looking-glass at the end of a long handle is the simple and ingenious device by means of which the trackmen of the German electric railways examine the power cable. Before the looking-glass came into use the examiners had to go down on hands and knees to peer under the guard of the cable.



Examining the Cable of an Electric Railway in Germany by Means of a Looking Glass on a Stick

INGENIOUS FIRE-HOSE REEL

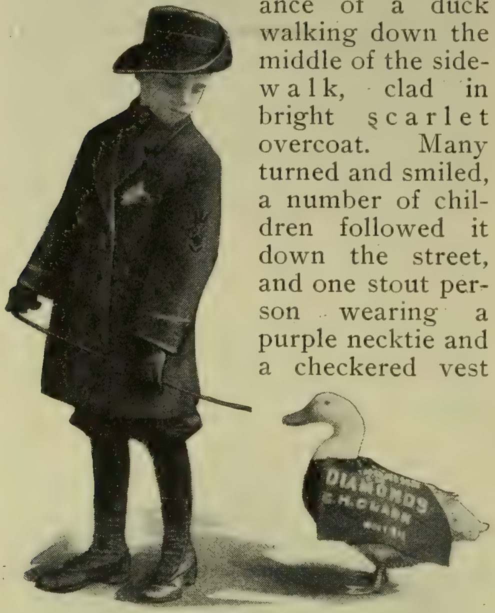
In the accompanying illustration is shown an ingenious fire-hose reel for hotels, business places of all kinds, and for homes. Its important feature is that the hose upon it is ready for immediate service without having to be entirely unwound. The water connection is at one of the bearings of the drum, the reel being constructed with a wrought-iron center having a bored waterway. The hose used is of a noncollapsible type, and there is always a clear waterway, without danger of kinks, no matter how much or little of the hose is unwound.



Any Length of Hose may be Unwound from This Reel, Water Being Supplied from Center

THE ADVERTISING DUCK

Shoppers on Broadway, Los Angeles, were amused recently by the appearance of a duck walking down the middle of the sidewalk, clad in bright scarlet overcoat. Many turned and smiled, a number of children followed it down the street, and one stout person wearing a purple necktie and a checkered vest was observed to clutch at a lamp-post, exclaiming, "Got 'em again." A duck in a scarlet overcoat is bound to attract attention, and that is what the local business man wanted when he put the little boy's pet to use by placing his advertisement on the garment. The fowl is devoted to its young master and follows him everywhere without a leading string.



An Advertising Duck on a Los Angeles Street

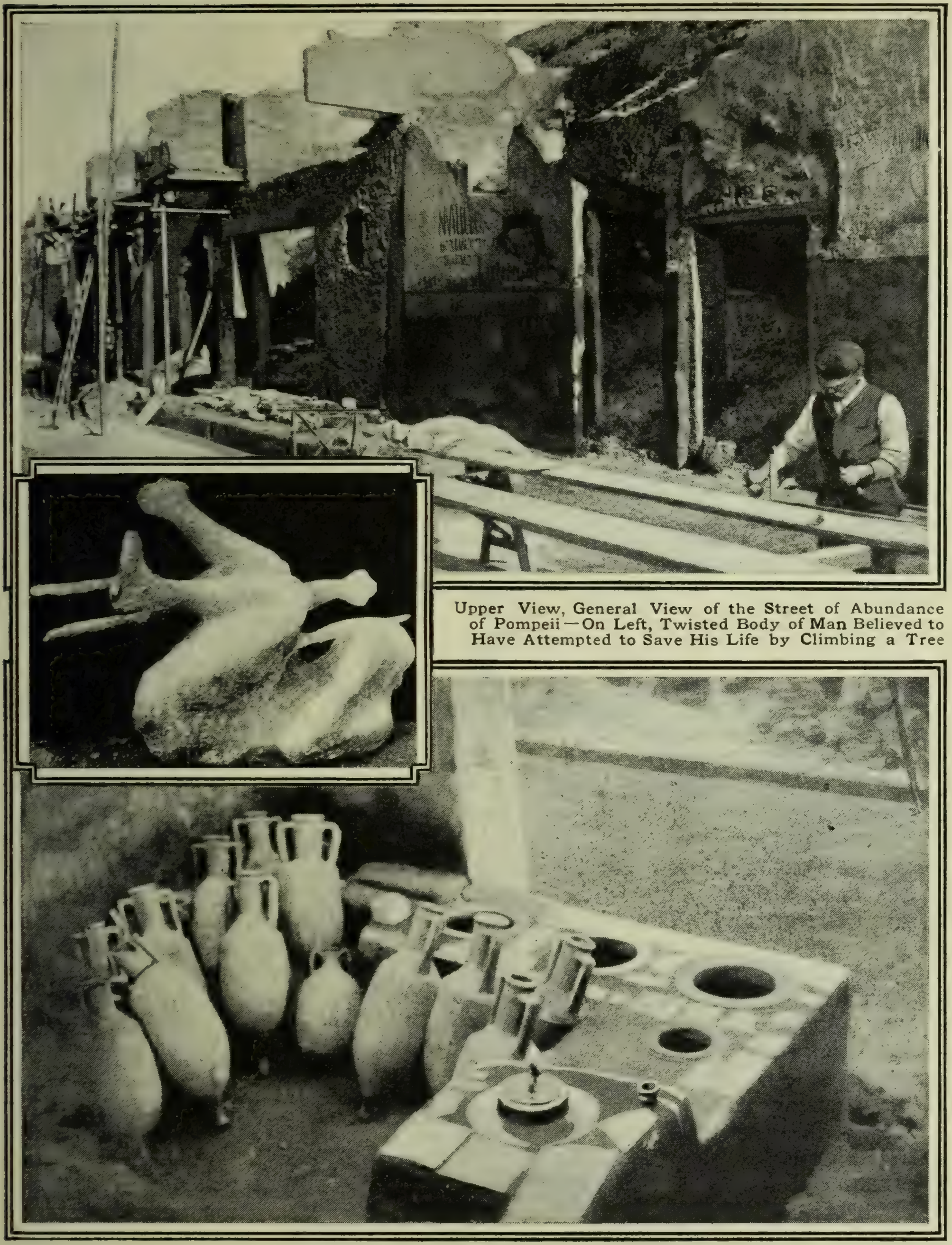
RAILROAD TO BE BUILT OF PANAMA CANAL MATERIAL

Secretary of the Interior Fisher has suggested that when the Panama Canal is completed, the construction material used in that undertaking be utilized in building a railroad in Alaska from Seward to the Matanuska coal fields. There were about 375 miles of rails and ties, about 40 locomotives, and 700 flatcars used in the construction of the canal. This material will all be of no use to the government when the canal is completed, and would no doubt be sold at a sacrifice, making ample allowance for depreciation. The cars that are used in the canal work could be converted into coal cars very easily, but the gauge of the cars and engines is 5 ft. instead of 4 ft. 8 in., which is the standard, and some difficulty might be experienced in trying to change the gauge. There is no doubt, as Secretary Fisher points out, that if the proposed road be constructed, it would open up a vast territory for development.

"HANDCUFF KING" ESCAPES FROM DIVING SUIT

When Harry Houdini, known as the "Handcuff King," was exhibiting recently in Norfolk, Va., he received a challenge from members of the submarine flotilla at the Norfolk Navy Yard to attempt an escape from a navy deep-sea diving suit. The challenge was accepted, and men selected from the crews placed the suit on Houdini. His body was encased in the heavy, high-pressure, waterproof garment, which inclosed the entire body from the neck, down to and including the feet, the copper breast and neck plate was put on and fastened to the lower garment with bolts, the brass and steel diver's helmet was placed over his head and secured with the usual brass wing-bolts and nuts, and then his feet were chained and his hands handcuffed. He escaped in 49 minutes.

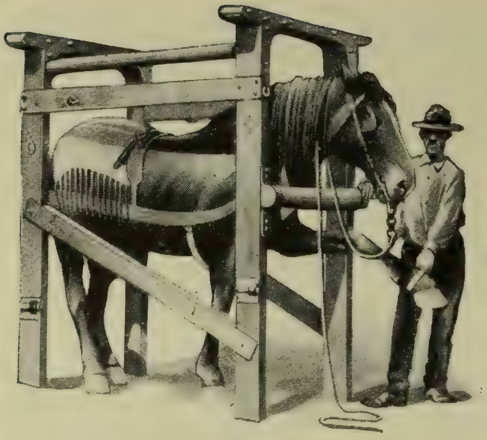
STREET OF ABUNDANCE IN ANCIENT POMPEII



Upper View, General View of the Street of Abundance of Pompeii—On Left, Twisted Body of Man Believed to Have Attempted to Save His Life by Climbing a Tree

Exterior of Pompeian Wine Shop Recently Uncovered, Showing the Counter and Vessels Used for Wines

Archeologists have made a series of remarkable finds in the ruins of Pompeii within the last year. The most interesting discovery was the body of a man found in such a position that the scientists are convinced he was attempting to escape the rain of ashes and lava by climbing a tree when the city was destroyed 2,000 years ago. The street which has just been uncovered has been called the "Street of Abundance." A wine shop was found with many of the vessels intact and some unusual signs and frescoes were also discovered.



A Frame or Cage for Horseshoeing in Zeeland

A DUTCH HORSESHOEING CAGE

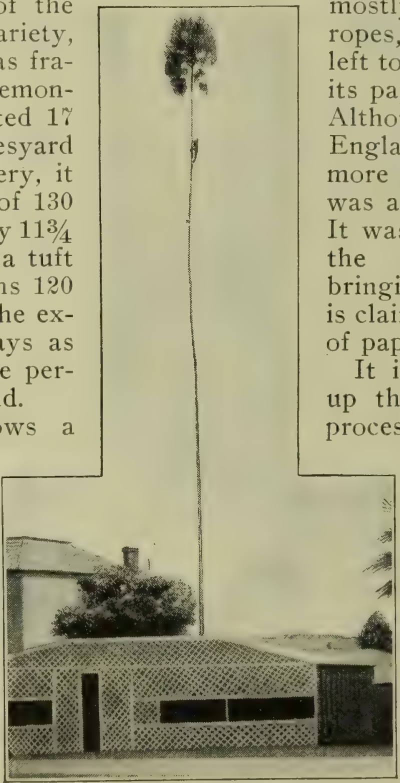
A horseshoeing scene in Zeeland, the Netherlands, is shown in the accompanying illustration. The horse is driven into a cage or frame, designed to keep the animal from breaking away or kicking during the operation.

ℭA California farmer works his farm 24 hours of the day, his farm hands being employed in regular eight-hour shifts, and his plows and other machinery of that sort being equipped with searchlights for use at night.

REMARKABLY PROPORTIONED GUM TREE

One of the most famous and unusual trees growing in Los Angeles is this remarkable gum tree of the lemon-scented gum variety, the foliage of which is as fragrant as that of the lemon-scented verbena. Planted 17 years ago in the city salesyard of a Los Angeles nursery, it has grown to a height of 130 ft., has a diameter of only 11¾ in. at its base, and has a tuft of branches which begins 120 ft. from the ground. The extremely thin trunk sways as much as 50 ft. from the perpendicular in a high wind.

The illustration shows a steeplejack climbing the tree to cut off a few straggling limbs, a calm day having been chosen for the operation.



A Los Angeles Gum Tree 130 Feet in Height, with a Trunk but 11¾ Inches in Diameter at the Base. A Steeple-Jack is Shown Climbing the Tree

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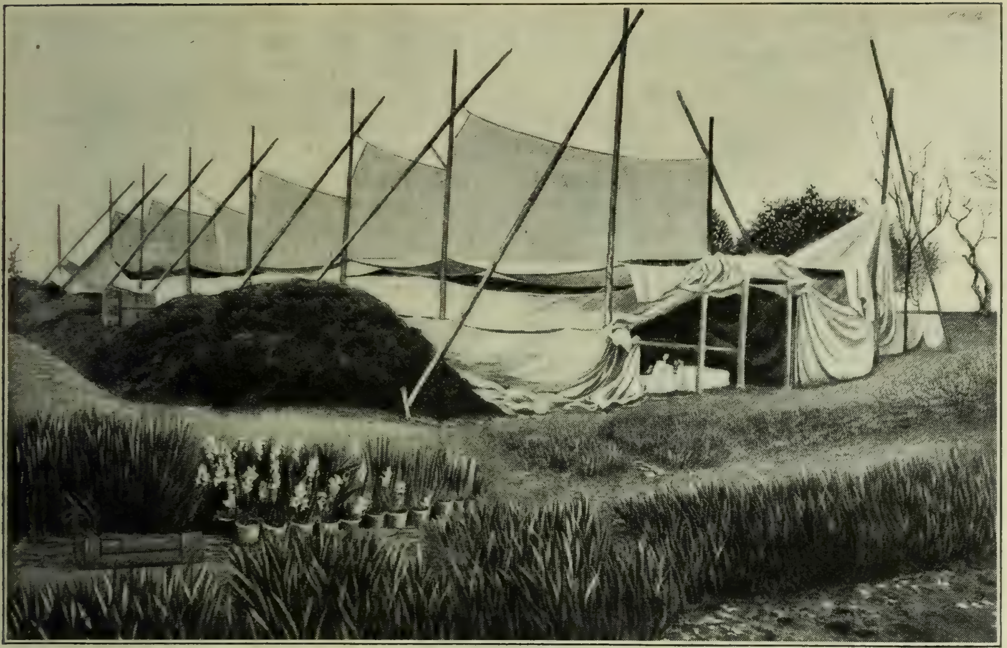
ALGERIAN GRASS FOR PAPER MAKING

In Algeria there grows today over 12,000,000 acres of a grass which is said to be destined to greatly cheapen the production of first-class paper throughout the entire world. It is esparto grass, and has never been grown in this country. In Algeria it is used mostly for weaving baskets, ropes, cords, etc., and it was left to the English to discover its paper-making possibilities. Although only imported into England a short time ago, more than 2,500,000 tons of it was absorbed there last year. It was used in 50 per cent of the English paper mills, bringing down the prices, it is claimed, of the finest grades of paper to one half.

It is not necessary to cut up the esparto grass in the process of converting it into paper pulp, but merely to boil the whole plant in lye for about five hours. This dissolves the balsams, resins and coloring matter, and then the fibers are removed to the washing and bleaching machines, which convert the stock into a mass ready for pulping. The expense of pulping the grass is



A Greenhouse Erected in London to Prevent Bulbs from Blossoming before the Time Desired

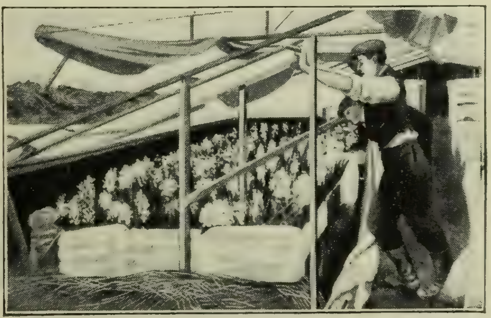
claimed to be much less than the pulping of rags, one great difference being in the chemicals. Only about 9 per cent of the lye required for rags is required for the grass. Special grades of caustic soda, absolutely free from lime, not only cheapen the cost of producing the pulp, but avoid the pollution of streams by mill refuse, and also make it possible for the paper manufacturer to use the same lye many times over again, merely by the addition of quantities of fresh caustic soda.

Two tons of raw esparto grass make one ton of pure white primary paper.

¶During the recent coal strike in Great Britain coal was selling at $2,150,400 a ton. Certain wise jewelers of London conceived the idea of selling "Black Diamonds." The mineral was nipped into shape, polished and mounted as tie-pins. Thousands of these black diamond tie-pins were purchased as mementos of the great coal strike.

A GREENHOUSE WHICH RETARDS GROWTH

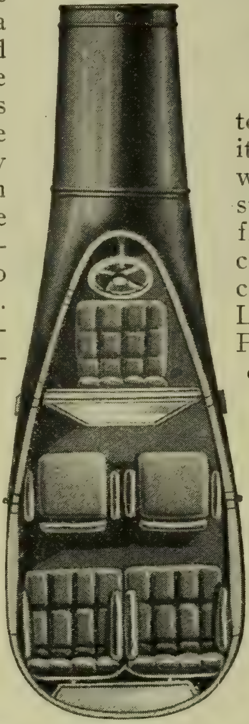
A Dutch landscape gardener in London who received quantities of Dutch bulbs for use in the gardens of the Dutch village, which was part of the Ideal Home Exhibition held recently at Olympia, constructed a greenhouse the purpose of which was to retard growth instead of to hasten it. This curious greenhouse was constructed of canvas instead of glass, and blocks of ice were laid all around the bulbs, so that the budding flowers would not blossom too quickly.



Cakes of Ice Placed Around Budding Flowers

NEW GERMAN TYPE OF AUTOMOBILE BODY

A new streamline automobile body of German make, providing an exceptionally smooth blending of hood and dash in its lines, which is a marked contrast to the abrupt angles and projections of the usual automobile body, is shown in the accompanying illustration. Other features are the placing of the steering wheel and the driver's seat in the center, where the driver's body will not prevent a clear view of the road ahead from the rear seats; and the deeply upholstered arm chairs substituted for the usual single wide seat. The two auxiliary seats in the passenger section of the machine are also of the arm-chair variety, and are arranged to swivel in order to facilitate entrance and exit. The single seat located centrally in the driver's compartment seems logical, as the extra seat beside the driver is seldom occupied by a passenger in a limousine type of car.



New German Model Having Interesting Lines, and a Single, Centrally Located Seat in the Driver's Compartment

EFFECT OF PAINT ON CORROSION OF IRON

According to the rather surprising results obtained by two German chemists, M. Liebreich and L. Spitzer, of Berlin, who were experimenting with paint as a preventive of the corrosion of iron, it seems that one coat of good paint or varnish is much superior to two or more coats. In their experiments a second or third coat proved absolutely detrimental.

The experiments consisted in painting well polished steel bars with one or more coats and suspending the bars over boiling water for four days. Half of the coating was then removed and the bared metal well covered with vaseline to prevent oxidation. In each case where only one coat of paint had been applied the bars remained as brilliant and rust-free as before the test, but in the case of two or more coats, corrosion had taken place.

The investigators would not commit themselves as to the explanation of this, but the French scientific magazine La Nature suggests it may be that a coating of several layers provides a less flexible cover, more liable to crack, thus allowing oxidizing agents to penetrate to the metal surface.

AEROPLANES SUFFER STRAIN FROM ABOVE

Until Lieutenant Sevelle fell to his death recently in France it was not admitted that the wings of aeroplanes could be subjected to breaking strain from above, but this proved conclusively that such is the case. It has, according to Louis Bleriot, in L'Aero, Paris, explained a whole series of hitherto not well understood accidents, including those in which Chavez, then Blanchard, Lantheaume and Ducourneau lost their lives. Witnesses of the Chavez accident did say that the wings of his machine had broken and dropped downward, but this was thought to be a mistake or an optical illusion. However, this accident led constructors to strengthen the wings, and the strengthening was still more increased after the subsequent accidents to Blanchard and Lantheaume. But it was in a machine with the latest type of reinforced wings that Sevelle made his fatal flight, and all four upper guy wires were found broken as if cut by shears.

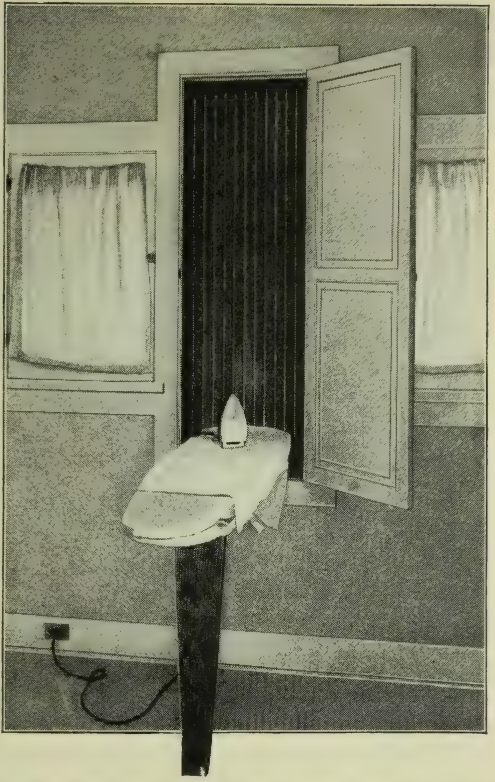
All the accidents referred to occurred under similar conditions and naturally led to the suggestion that the wings were submitted to forces from above, which they were not equipped to withstand. There is no room for doubt that the accidents were caused by the breaking of the upper wires, and not, as was hitherto assumed, to the breaking of wings which had successfully withstood resistance tests from below.

"It would seem necessary, therefore," says Louis Bleriot, "also to test the resistance of wings against strains from above, in order to obtain upper wiring of sufficient strength. The relation between the strengths of the upper and under wiring should, in my estimation, be about as 3:5. However, as the inertia of an aeroplane is increased as the square of its speed, if one assumes a coëfficient of safety of 5 as sufficient for a machine flying at 60 miles an hour, this coëfficient should be increased to 20 in an apparatus flying with twice that speed.

"It must also be considered," says Bleriot, "whether the airman's body can resist the shocks that will be the consequence of such coëfficients. I believe that the body of a seated man could not sustain a shock from above of more than twice his own weight without being thrown out of his seat, nor that it could resist a shock in the opposite direction of more than that corresponding to a coëfficient of 5 or 6, without having his internal organs dangerously displaced. There is, therefore, no reason to insist on exaggerated values of these coëfficients of safety. Their values must always be limited by the resistance of the airman's body."

"From the further study of these conditions," he concludes, "much should result that will tend to increase the safety in flight."

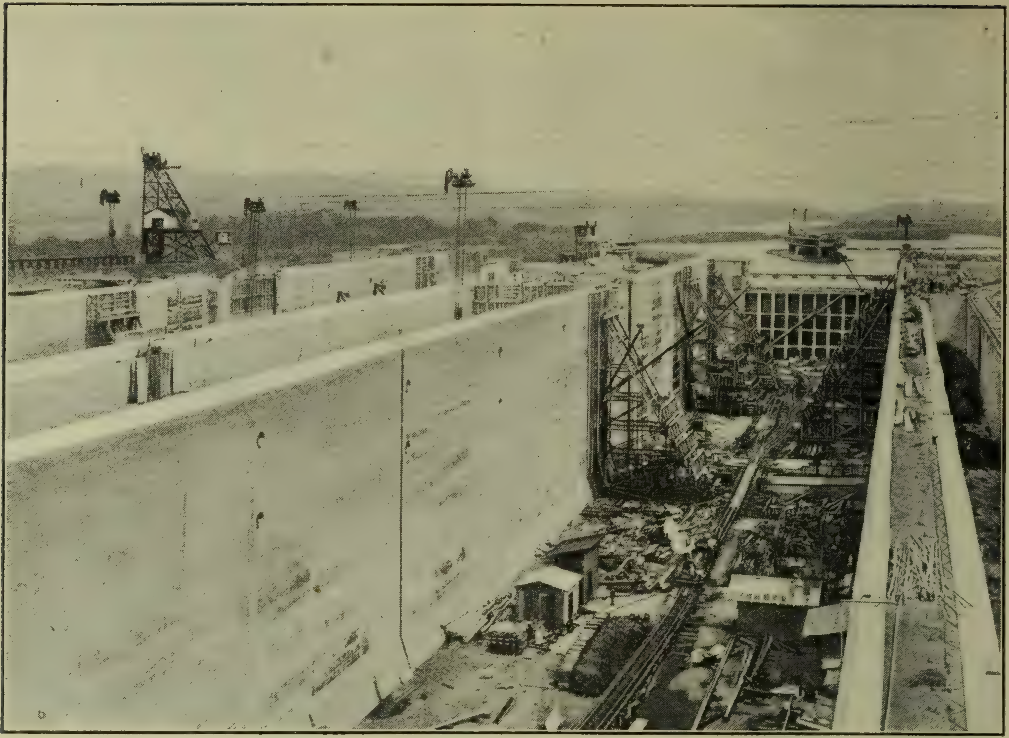
BUILT-IN IRONING BOARD


The Cabinet-Kitchen of a Los Angeles Bungalow with a Special Cabinet for the Ironing Board

In the accompanying illustration is shown one end of the kitchen of a bungalow in Los Angeles, Cal., one of the kitchen-cabinet features of which is an ironing board that folds up into a cabinet in the wall. When the ironing is finished, all that is necessary is to push the board upward, the inner end being hinged to the bottom board of the cabinet. The leg naturally folds up against the board. The electric iron may be quickly detached from the wall socket and placed in the cabinet with the board. The arrangement of the numerous cupboards, drawers and cabinets of this kitchen is also interesting.

DETECTING THUNDER STORMS BY WIRELESS

By means of a modified wireless set recently installed in the observatory in Lyons, France, M. Flajolet has been able to note atmospheric electrical disturbances at a long distance. In some instances thunder storms have been detected when more than 300 miles away. A mineral detector is used in the set instead of an electrolytic detector, as the latter was found to be unsatisfactory for this kind of work, in which it had to be in circuit continuously and would get out of order.



TRANSFORMING THE PANAMA DREAM INTO A REALITY

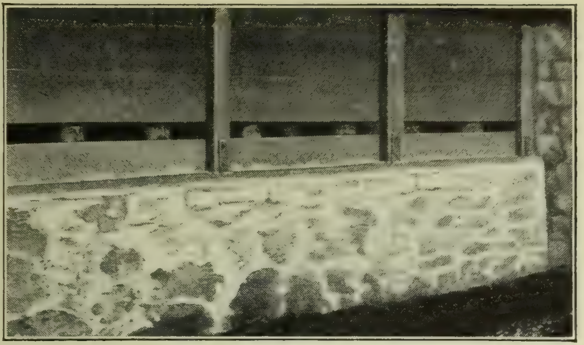
The latest photographs of the Panama Canal show how closely the engineers have gauged their ability in promising the completion of the big ditch by next year. This picture of one of the Gatun Locks was made a few weeks ago, and there seems to be little more to be done to it beyond removing the scaffolding and other construction aids, and material. This particular point along the canal will be one of the busiest on the Isthmus when the canal is finished. Ninety-eight electric motors will be in operation twice during each lockage at the Gatun Locks, in raising a ship through a vertical distance of 85 ft. from the sea level to the level of the lake. These motors are used in lowering fender chains, opening and closing six pairs of gate valves, 30 cylindrical valves, and six pairs of gates.

AEROPLANE BOMB TESTS WITH REAL BOMBS

A program of events of practically every aviation meet in this country and abroad in the past year or two has included bomb-dropping competi-

The Aero-Target Used in the Bomb-Dropping Test for the Michelin Prize

The Bomb-Proof Viewing Shelter Erected for the Judges



The Judges Watching the Competition through a Long Narrow Slit in the Wooden Portion of the Shelter

tions, but the bombs have usually been imitations instead of real explosives. In the recent bomb-dropping test in France, for the Michelin prize, real explosives were used, and the method of protecting the judges is interesting. The aero-target was of concrete, about 32 ft. in diameter, and near it was erected a bomb-proof viewing shelter for the judges. The judges watched the competition through a long narrow slit in the wooden portion of the shelter.

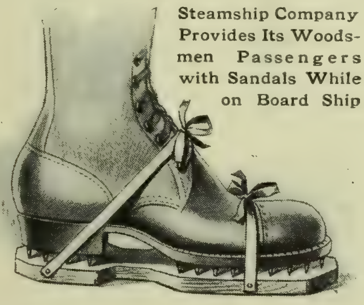
FLOWER-VASE CENSER

Seemingly a vase with an imitation flower in it, this Parisian novelty is in reality a censer in which a deodorizing fluid is burned, together with a special perfume representing the odor of the particular imitation flower which is used to form the top. It is made in a variety of styles and shapes.

ℭThe new British battleships "Centurion" and "King George V" are to be fitted with anti-rolling tanks, these being the first warships to be so equipped.

SANDALS GIVEN WITH EVERY TICKET

Loggers and woodsmen, wearing their heavy calked boots as they come out of the Puget Sound forests, have played havoc with the expensive carpets, hardwood floors and tiling aboard Sound steamers, many of which are very handsomely fitted for passenger traffic, and carry thousands of tourists during the summer months. The sharp calks on the loggers' boots cut the carpets to rags, gouge the floors and ruin the tiling.



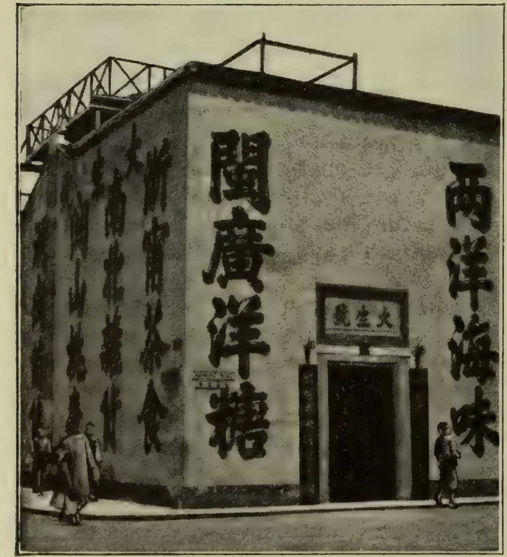
Steamship Company Provides Its Woodsmen Passengers with Sandals While on Board Ship

One company, which controls much of the steamboat business on the Sound, is trying to solve the problem by the introduction of "loggers' sandals." For a long time loggers have been refused passage unless they would remove the calked boots, but as many of the men were just out of the woods and had no other boots or slippers to wear, this worked a hardship. The general manager of the transportation line invented the sandal, which is simply a thin wooden sole with tape ties. It can be quickly tied beneath the sole of the heavy boot, and the passenger can clump about with some degree of comfort.

Ticket agents are being supplied with stacks of the sandals. As they sell a ticket they scrutinize the passenger's boots, and if he wears the high-topped calked boot of the logging camps, he is handed a pair of sandals with his ticket. The immediate cause for the introduction of the sandals is that the company's boats have recently been refitted with carpets, and the floors varnished and repaired; and the owners did not care to take any chances of continuous damage.

PAWNSHOPS IN CHINA

Pawnshops in China are of great antiquity, possibly antedating the Christian era. As a rule they are quite similar in appearance, in the country districts being almost invariably in the form of a square tower about four stories high. They are the most prominent objects in the landscape, looming up like the churches in the French Canadian hamlets of Quebec. A distinguishing feature is the lack of windows, particularly on the lower floors, so as to offer as little opportunity as possible for forcing an entrance. It frequently happens in the country, after a bad harvest, that the people are on the verge of a famine, and after having pledged everything they possess that is pawnable, they storm the pawnbroker in his citadel.



The Individual Architectural Characteristics of Chinese Pawnshops

Through experience the broker has learned to take precautions against a sudden attack or siege so that as soon as danger threatens, he barricades himself within, and all business, henceforth, is carried on from the roof or one of the uppermost windows by means of a basket lowered by a string. If the needy should actually be dying of starvation, custom prescribes that the pawnbroker must come to their assistance—experience probably having taught him, in the course of ages, that, were his clientele to die off he would have to go out of business.

The illustration shows a shop on one of the principal thoroughfares of Shanghai. As the city is under foreign control and efficiently policed, an ample doorway facing the street has been provided. This building is not as high as those in the country and lacks the small windows in the upper floors, probably for the reason that there are no quarters. The doorway can be efficiently barricaded at a moment's notice; but over and above this, further precaution is taken. The interior is fenced off by a heavy wooden grill, just back of which rises a structure not unlike a judge's bench, but higher. At this sits a clerk with several assistants to whom the client must pass up his pledge for examination.

The bookkeeping is so well systematized that even in case a ticket is lost, the full particulars concerning the pledge can be at once determined. The rate of interest varies, but for small loans is usually about one per cent a month. Foreigners frequently pawn their furs for safe keeping during the summer months. Excellent care is taken of them at very nominal expense as the loan may be almost as small as desired.

ACTUAL USE OF DIRIGIBLES IN TURKO-ITALIAN WAR

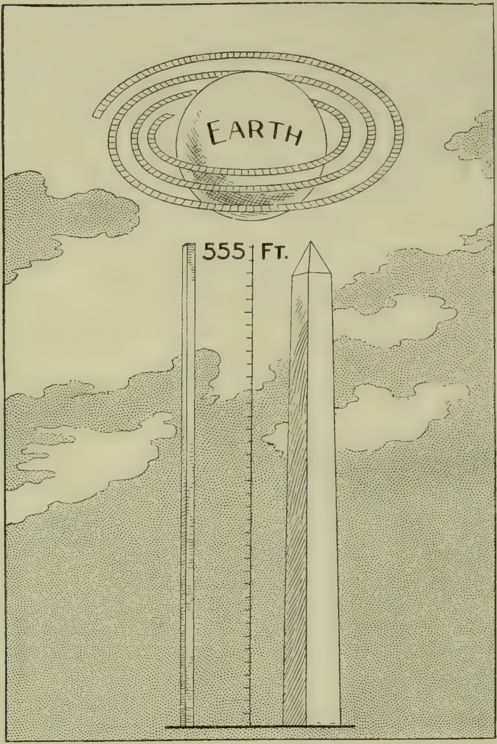
One of the Italian Dirigibles Ready for a Flight over the Turkish Lines

An Italian Dirigible Returning after an Aerial Bombardment of One of the Enemy's Camps

Illustrations have been previously published in this magazine showing how Italy is utilizing aeroplanes for actual service in the war with Turkey. She is also the first country to demonstrate the possibilities of the dirigible in war, and is now using a number of them. Two of Italy's military dirigibles made recent flights over the enemy's encampment at Zavia, dropping 25 bombs from a height of 2,000 ft., causing slaughter and confusion.

THE TROUBLES OF THE PATENT OFFICE

From basement to attic, in rooms and galleries, along corridors and under the steps of the Patent Office building, the storage of patent documents has continued until there are now over two miles of cases, nine shelves high. If all the copies of patents stored in the building were laid end to end, they would form a strip 75,000 miles long, which would reach three times around the earth. Placed in a pile, they would form a mass 15 ft. square and as high as the Washington monument, and, if placed on one continuous shelf, a shelf 19 miles long would be required.



Patent Documents on File in U. S. Patent Office would Stretch Three Times around the World, or would Form a Mass 15 Feet Square, as High as Washington Monument

The quantity of the material, however, is not the only feature that troubles the department. The dust accumulates faster than it can be cleaned off, and the great quantity of paper and wooden shelves makes the danger of a disastrous fire always imminent.

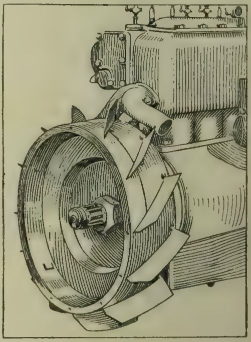
An average of 800 patents are granted each week. An estimate of $220,000 has been submitted to Congress for an appropriation for the construction of an additional wing.

LOADED CARS LIFTED BODILY BY ELECTRIC HOIST

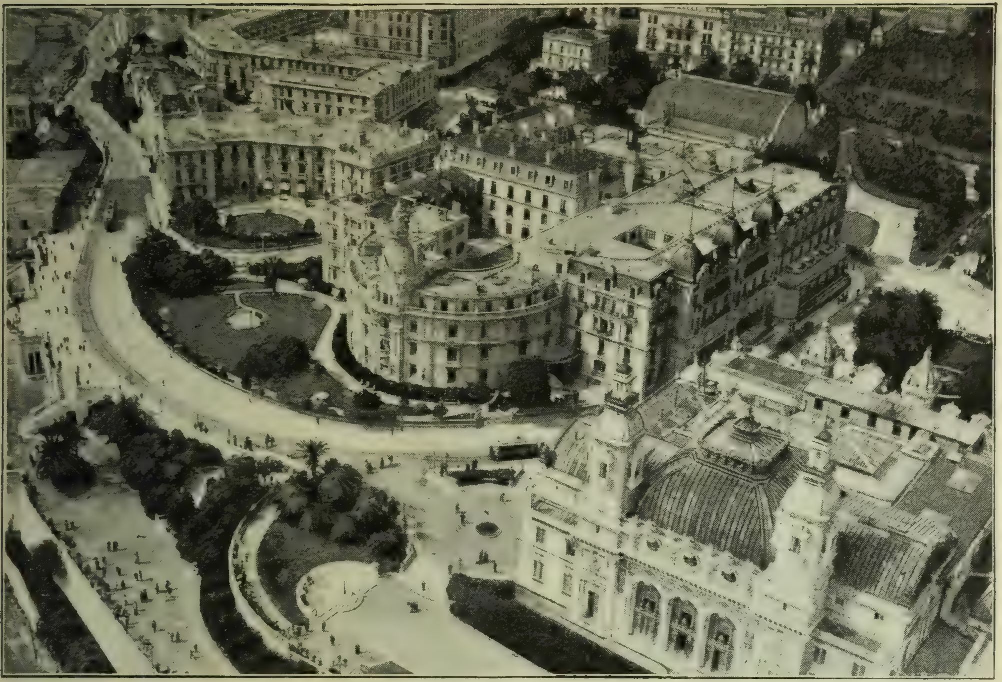
The freight cars carrying material to be used in the construction of the approaches to the new St. Louis municipal bridge across the Mississippi River, were lifted by means of powerful electric hoists, load and all, from the main track to the level of the approach, 112 ft. above, and a switch engine then pushed them to the point where they were to be unloaded. Ordinary flatcars were handled in this way, their trucks being chained to the car-body before they were raised from the lower tracks. The weight of the car and its load often exceeded 75 tons. The object of handling the cars in this manner was to save time, the cars being deposited at the point where they could be unloaded a piece at a time, and the necessity of handling the load twice thus eliminated.

CONVERTING FLYWHEEL INTO FAN

At least one concern in the automobile industry is making an attempt to do away with the regulation fan for cooling the engine. They fit the flywheel with peripheral blades, thus cooling the engine direct from the flywheel.



ℭChina's first trial by jury took place in Shanghai, March 25 of this year, under a new code of laws prepared by Dr. Wu Ting Fang, Minister to the United States of the Chinese Republic.

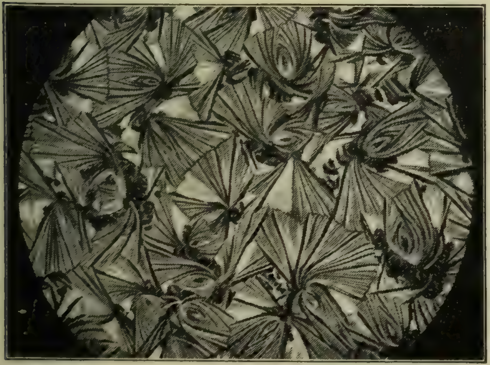


MONTE CARLO FROM A HYDRO-AEROPLANE

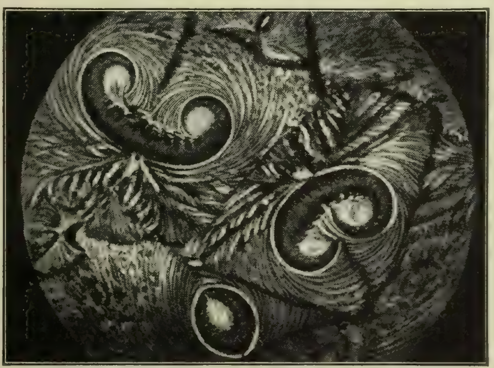
The Bay of Monaco has been the scene of the first hydro-aeroplane meet held in the world, and eight types of the air-and-water vehicle were displayed. During the course of the meeting a number of photographs were made from the machines while in flight, this one being one of the clearest and best as it gives an excellent view of the far-famed Casino and at the same time shows something of the surrounding buildings and parks. The Henri Farman type of hydro-aeroplane was considered by the judges the best shown. Maurice Farman's entry was second. Both are biplanes.

PHOTOMICROGRAPHS AS ART PATTERNS

As illustrative of the German tendency to utilize scientific progress in commercial production the accompanying illustrations are of special interest. They represent photomicrographs of crystallization forms of chemical solutions as seen under the microscope. They are taken from a



This Photomicrograph of a Chemical Solution Provides a Beautiful Design for Cut Glass

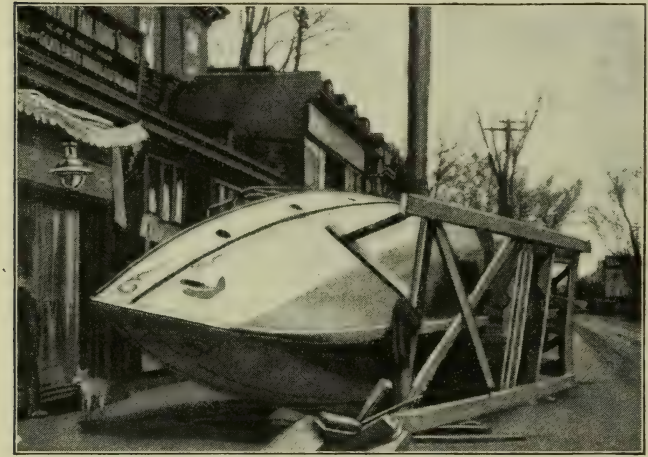


Design That Would be Fine in Colors for a Vase recent German work which is published for the sole purpose of furnishing new pattern and ornamentation designs for various arts and crafts.

Imagine for instance the beauty of a cut-glass dish in the pattern shown in one of the illustrations, and of the other, for instance, in colors in a majolica vase. The designs thus obtained by photographing a drop of chemical under the microscope are just as available for designs in wallpaper, metal work, pressed leather, glass painting, textiles, etc.

MOTORBOAT WRECKED IN A CITY STREET

During a motorboat exhibition recently in Montreal, Canada, a truck which was transporting a 40-ft. raised-cabin cruiser collapsed and the boat was pitched onto its side, half on the pavement and half on the sidewalk. The only apparent damage was some broken china and glassware in the cabin, and a scratching and rubbing which required nothing more than a new coat of paint on one side.


A Motorboat Stranded in a Montreal Street by the Collapse of a Wagon Axle

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¶Though Philadelphia is noted as being a city of sober, abstemious people, the city directory just printed shows the names of a number of citizens that belie this reputation, as there are 8 Drinkhouses, 275 Bars, 9 Rummers, 7 Drinkers, 1 Drunk, 10 Drinkwaters, 9 Wets, 1 Dry, 5 Brews, 20 Beers, 9 Wines, 1 Gin, 255 Steins and 53 Seidels represented in the long list.

NEW USES FOR TUNGSTEN AND MOLYBDENUM

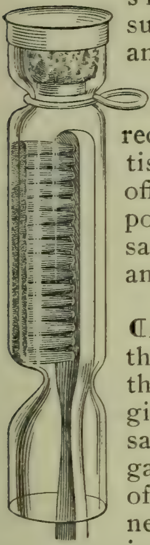
There were only two practical applications of the two metals tungsten and molybdenum previous to their production in a ductile form: in steel making, and in electric lamps, the tungsten being used for filaments and the molybdenum for filament supports. The drawn tungsten filament, being of greater strength, however, almost entirely replaced the earlier forms.

The electric furnace wound with tungsten or molybdenum wire has been found superior to the furnace wound with platinum wire, both because of the higher temperatures and quicker heating attained, and because these metals are cheaper than platinum. They both serve as good substitutes for such metals as platinum, platinum-iridium and iridium, in make-and-break devices for electric circuits.

On account of its higher melting point, as compared with platinum, tungsten affords an almost indestructible target, upon which the cathode rays in the Röntgen tube may be more closely focused, which will result in a sharper definition and shorter exposure.

Careful consideration is being given at the present time to the possibility of using wrought tungsten for projectiles. It has a high specific gravity which will give it a longer range, and its hardness and great tensile strength should give it a better penetrating power than the materials now used. It is suggested, however, that the small tungsten bullet of the same weight as the ones now in use would have the disadvantage of not producing as disastrous results to the victim, unless it should hit a vital spot.

SANITARY TOOTHBRUSH HOLDER



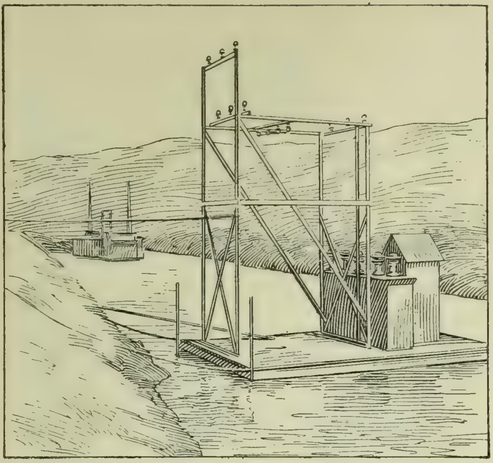
This sanitary toothbrush holder, which is of European origin, consists simply of a glass tube of sufficient diameter to admit an ordinary toothbrush, the upper end of the tube terminating in a cup-shaped receptacle containing an antiseptic tablet which gives off microbe-destroying vapors, or a wad of cotton kept saturated with some kind of antiseptic liquid.

ℭAn English electrical authority announces that while the cost of cooking to a given degree would be the same with electricity as with gas, in order to obtain 12 lb. of cooked meat it would be necessary to put 17 lb. 2 oz. into the oven of a gas stove, while but 13 lb. 10 oz. would be required by an electric oven, the difference being the amount of moisture, etc., that would be extracted from the meat in the process of cooking.

TRANSFORMERS PLACED ON A FLOAT

An interesting installation of outdoor transformers used in the construction of the Los Angeles aqueduct, is shown in the accompanying illustration. The transformers were placed on a float and were towed from place to place as the work progressed, connection being made to an adjacent high-tension line. The high voltage was stepped down by these transformers for use on an electrically operated dredge.

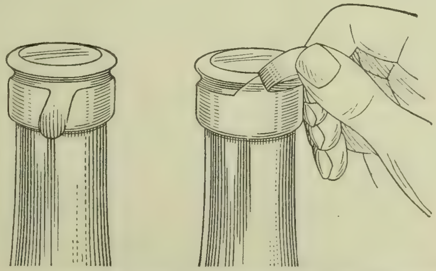
The outdoor type of transformer is a comparatively recent development in the electrical field, its special purpose being to distribute electric power from high-voltage lines for use in industrial plants and small towns where the small amount of power sold would not make the installation of a regular substation economically feasible.



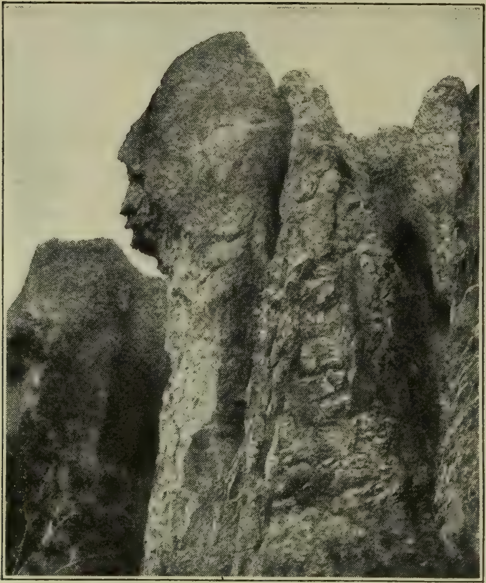
These Transformers, Placed on a Float, Stepped the Voltage of a High-Tension Line for the Operation of an Electric Dredge

NEW BOTTLE CAP

A French concern is manufacturing a new type of bottle cap or stopper, the feature of which is the ease with which it may be removed from the bottle. The metal cap in general use on beer bottles, and the like, in America requires some kind of opener for removal, but this cap is provided with a metal tab which, when lightly pulled in the fingers, tears the rim of the cap off.



Tab Affords Means of Readily Removing Metal Bottle Cap



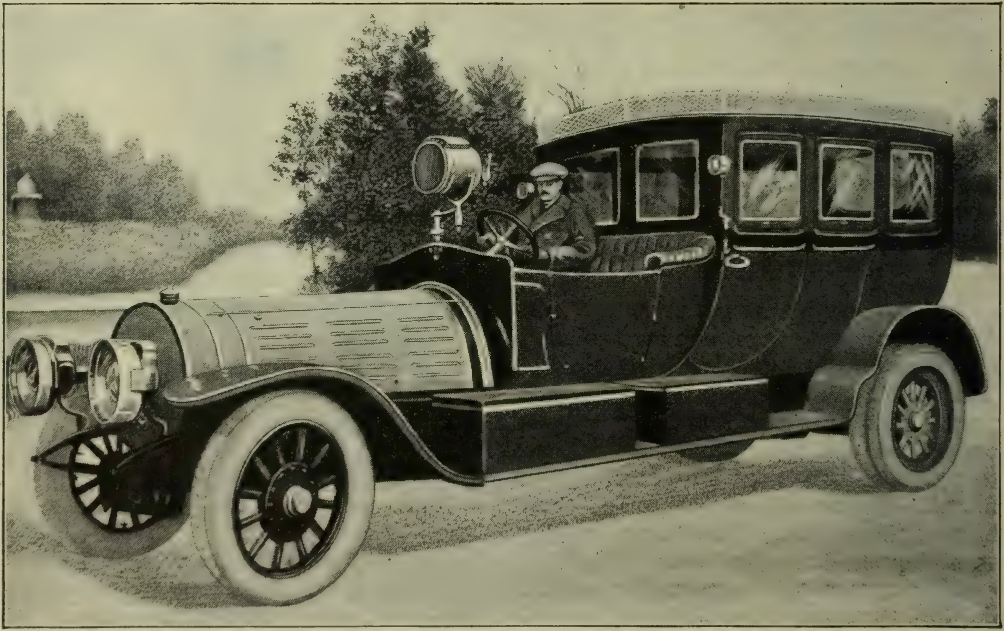
The Cowled "Monk's Head" of Cooney Canyon, New Mexico

NATURE AS A SCULPTOR

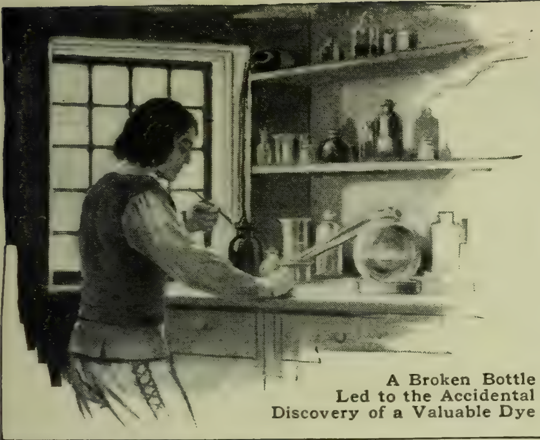
Almost every western state has one or more natural statues; some are carved so perfectly by the action of the elements as to be startling in their expressions. One of the most striking is the "Monk's Head," in Cooney Canyon, New Mexico, a freak of nature which brings out in clear relief a man's face, the head appearing to be hooded. The figure is of giant proportions and at a distance, sharply outlined against the sky, it seems impossible that it is not the work of some ancient people who may have wrought upon it with crude tools, yet obtaining a singularly strong and virile expression of countenance.

LARGEST TOURING AUTOMOBILE

The automobile recently delivered by a French company to the chief inspector of the finances of France is claimed to be the biggest touring car ever turned out. It is a six-cylinder model developing 160 hp., and has a wheel base of 198 in. It has an eight-passenger limousine body, the rear wheels are fitted with twin tires, and its lighting equipment includes electric head and side lamps and a powerful acetylene searchlight pivotally mounted on the dashboard.



Exceptionally Large Touring Automobile Used by the Chief Inspector of French Finances



A Broken Bottle Led to the Accidental Discovery of a Valuable Dye

Great Discoveries Due to Happy Accidents

By

G. E. CHAMBERLAIN

IT IS repetitive history that many a person who has spent hours upon hours combining and recombining the factors of his problem, has had the solution thrust upon his attention by some casualty of daily life. Such occurrences are the spice of research and lead on many a weary investigator in hard and exacting labor. Here is the field where the trained observer has all the advantage. For how many fortunes may never have been realized only because no one had eyes to behold the revelation?

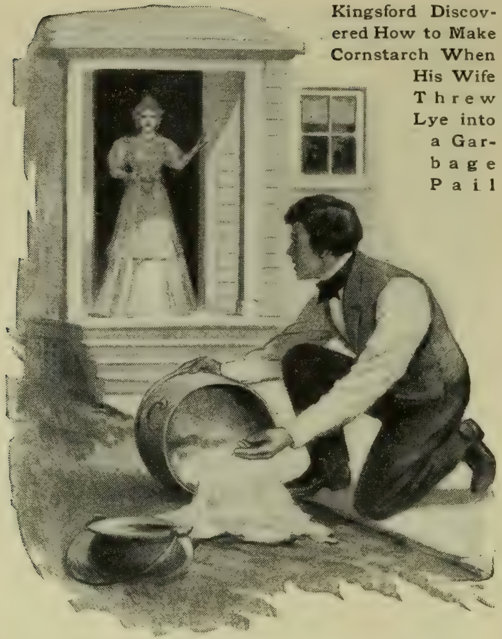
In our own time every beet-sugar factory was confronted with these two problems: How most cheaply to move the beets from the storage sheds to the slicers; and how to cleanse the beets from the dirt, small stones, and rubbish carried from the earth silos. A German factory happened to have a considerable quantity of beets piled alongside an open drain. A very heavy rainstorm came on, and when it was over, it was found that the beets had not only been carried to the very door of the factory, but were cleaned as well. From that time on every factory has flushed its beets from storage to plant and saved money by combining the two operations of transportation and washing.

Thomas Kingsford discovered the process of making starch from Indian corn by chance. Starch could be made from potatoes and from wheat, but it had always been found impossible to separate cornstarch from the accompanying gluten. The wheat-starch methods did not answer. Kingsford was a mechanic working long hours, and all his experiments were made in his own kitchen with his wife's pans, tubs, and buckets as his laboratory utensils.

The unsatisfactory result of one of his experiments—a mush of cornmeal and water—he disgustedly threw into a garbage tub. A little later his wife threw into the same tub some lye wastes. Upon emptying the tub the next day, Kingsford was surprised to find a small amount of fairly pure starch at the bottom. His wife fortunately remembered throwing in the lye, and thus the basic principle was discovered.

Kingsford soon worked out a practical process for making cornstarch commercially, and he not only made a great fortune for himself and his descendants, but laid the foundations of an industry which consumes 30,000,000 bu. of corn annually in the United States alone.

In 1742, Thomas Bolsover, a mechanic of Sheffield, Eng., discovered the art of silverplating. He was repairing the handle of a knife in which both copper and silver were used. Accidentally the two metals were fused together. Based upon this observation he developed the new process. Upon a thick ingot of copper he bound by iron wire a thinner ingot of silver. The whole was then heated in a reverberatory furnace until the edges of the silver ingot were observed to begin to



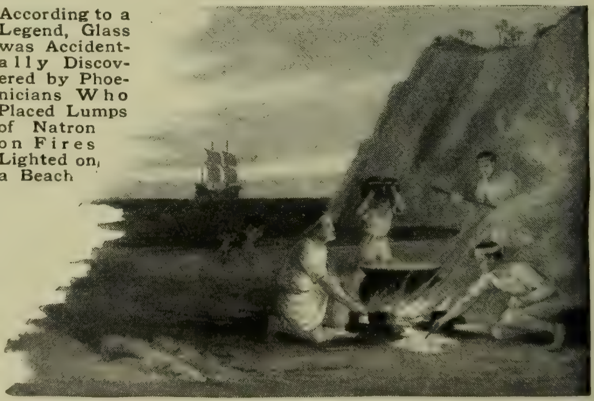
Kingsford Discovered How to Make Cornstarch When His Wife Threw Lye into a Garbage Pail

melt. The two ingots were then removed from the furnace, slowly cooled and pickled, cleaned and rolled to the desired thickness. The result was a plate of copper more or less thinly covered with silver on one side. This was the first Sheffield plate. For 50 years following, the copper was plated on one side only, and the cut edges showed the copper. Later, the process was so perfected that no copper was left exposed. All the silverplate of the world was made by this process, until electroplating was discovered and made commercial.

The many technical processes of the ancients were without doubt of accidental origin. Until comparatively recent times there was no groundwork of theory in either metallurgy or chemistry, and intelligent investigation, planned to accomplish a certain result, cannot exist without this groundwork. The only opportunity for technical progress was that afforded by chance in conjunction with a keen and inquiring observer. For instance, the Romans knew nothing of the metal zinc. But some observing Roman mechanic had found that when stones of a certain kind were heated with copper, a hard, yellow metal was obtained. Thus brass was discovered and in this manner it was made for centuries. We know now that the stones which possessed these curious properties were the minerals calamine and smithsonite, the silicate and carbonate of zinc respectively. They occurred together in mines, which were, at that time, worked for the iron ores.

Vitruvius is our authority for the statement that the manufacture of red lead was the result of an accidental fire. He also tells us that red lead made by calcining white lead in a furnace was much superior to that obtained directly from the mines.

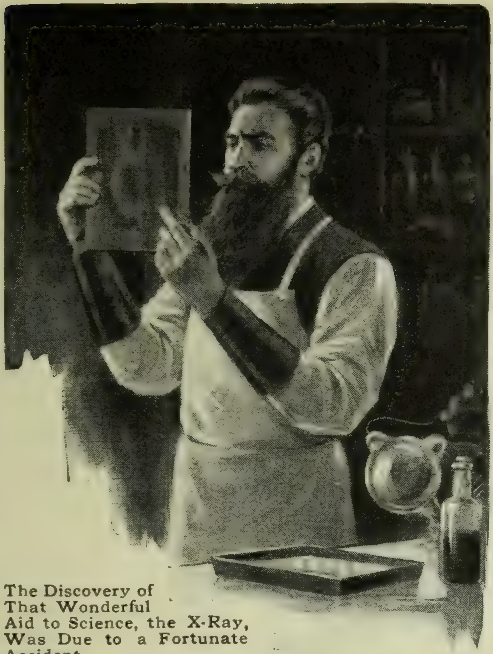
This is similar, in a way, to the legendary story of the discovery of glass by the Phœnicians. The tale runs in this way: Certain of their merchants, returning from Africa in a ship loaded with natron (crude mineral soda ash), found it necessary on account of bad weather to seek harbor. They found themselves on a sandy plain near Mount Carmel. They built fires on the sand and placed their kettles over the fires on lumps of natron. The heat fused the sand and natron together, forming the first glass. Whether or not the story be true in its details as handed down, the essence of it is certain, viz., that glass was discovered in this manner, probably at different times by men of different na-



According to a Legend, Glass was Accidentally Discovered by Phoenicians Who Placed Lumps of Natron on Fires Lighted on a Beach tionalities, as its manufacture was known by many people at an early period.

Vitruvius again tells us that in Spain were found certain stones which, after having been "punished" (beaten) with iron rods, for a sufficient length of time, began to "perspire," and the "perspiration" was mercury. Certainly, it was a crude manner of reducing the mercuric ore, cinnabar, with metallic iron, but surely feasible. He fails to tell, and one cannot but wonder, by what happy accident this method was discovered. Could it be that hammering stone was an official punishment then as it is now?

In setting or mordanting certain dyes, the salts of tin are indispensable. The origin of their use is but little known. Cornelius Drebbel, about the year 1610, was doing some work with cochineal. On a shelf overhead was a bottle of aqua regia, a mixture of nitric and muriatic acids. This bottle was broken and the acid trickled down a window frame and part of it ran into another bottle containing an extract of cochineal. A brilliant scarlet resulted. Drebbel later attempted to repeat the experiment by adding aqua regia to extract of cochineal but there was no change of color. After very careful study, he noticed that a part of the window frame down which the acid first ran was covered with tin. It appeared that tin was the active element, and further experiment confirmed this conclusion. As a result Drebbel owned the secret of making a dye having many new and valuable qualities, and today this is an important use of tin.



The Discovery of That Wonderful Aid to Science, the X-Ray, Was Due to a Fortunate Accident

Roentgen was not looking for X-rays but, after an experiment on an entirely different subject, he noticed that some photographic plates, which had been left near by, were fogged. He sought the reason and his great X-ray discovery was the result..

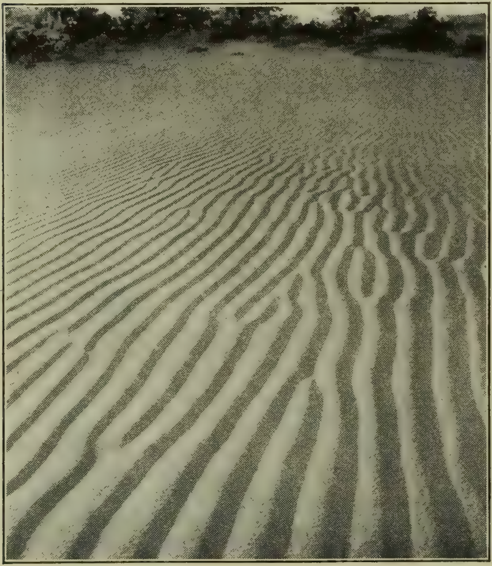
In 1884, Dr. Reusen was conducting an extensive research into a certain family of coal-tar derivatives. One of his students was a German, named Fahlberg. This young man, one evening after returning to his boarding house, ate his dinner without having washed his hands. During the course of the meal in some manner he became aware that he had some extremely sweet substance on his fingers. He at once returned to the laboratory and tasted of every solution there. In a certain beaker he found the source of that sweetness.

He gave the new substance a commercial nickname, saccharin, and it was a wise action because its real name was "orthobenzosulphonimide." Whether the fortune he made was due to a lucky accident or his boarding-house training, remains a moot point among his contemporaries. It is also curious to note, in this connection, that after more than 25 years of general use by diabetic sufferers as a harmless substitute for sugar, this substance has recently been put under the ban by the Chemistry Bureau of the agricultural department. It is now forbidden not only to the sick, who consumed great quantities of it, but to the well who have unknowingly eaten their share under the guise of table syrups.

The pages of science are replete with similar instances, and that is one of the reasons why the hard and dreary outlines of technical research are softened and rendered alluring: The chance of the great discovery, the possibility of great fortune or renown, the glamour, the enticing glamour that leads the student digging deep for nature's secrets ever on and on.

PECULIAR SANDSTONE FORMATION

In the region of the Black Buttes of Wyoming is found a large stretch of most peculiar sandstone formation.



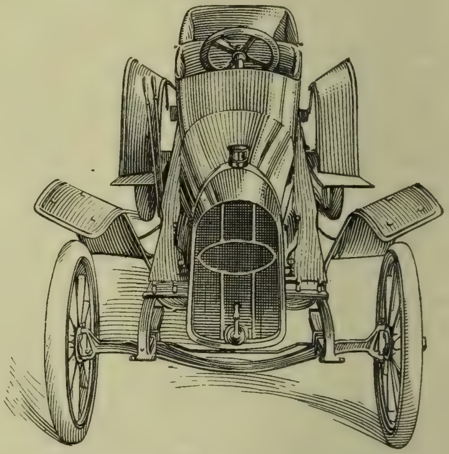
Sandstone Formation Resembles Sand Blown into Ripples by the Wind

Approaching it, the traveler assumes it to be, of course, sand, blown into ripple marks by the wind. It was, in truth, so formed by the wind, but many thousands of years ago, for it is hard sandstone. So deep and clearly cut are the ridges and trenches that it seems as though the stone must have been artificially chiseled by some human machinery.

It is in such sandstone formations that the fossil bones of many species of antediluvian animals are found, sometimes almost perfectly preserved. In very many parts of the world—the Old World, as well as America—the sandstone has proven a most efficient preserver of fossils and also of the tracks of the various creatures which roamed the earth before the first human beings, or were contemporaneous with the early cave man with his crude club or stone axe.

SPECIAL COURIER AUTOS FOR GERMAN ARMY

One of the latest types of military automobiles developed in Germany is a light car especially designed for the use of couriers in carrying dispatches. The engine develops 16 hp., which is sufficient to drive the little car at a high speed. The rather high wheels, wide wheel base, etc., compared with the size of the body, were adopted through consideration of the fact that such cars would have to do much work in difficult roadless country.



A Light German Military Automobile Designed Especially for Army Couriers

ℭAn American actress, who is working her way around the world on a wager, states she found it harder to obtain employment in London, Eng., than in any other city she visited.

PREHISTORIC DINOSAURS FOUND IN UTAH

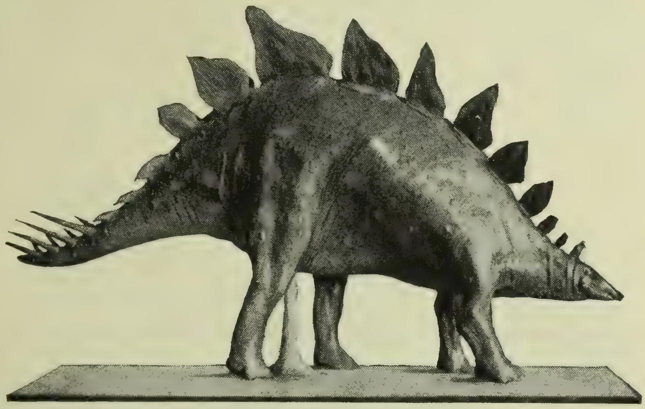
By HARTLEY M. PHELPS

What is believed by paleontologists to be an important find of hitherto undiscovered species and genera of prehistoric land reptiles has been made by a research party sent out by the Carnegie Museum of Pittsburg, Pa. Twelve fossils or skeletons of dinosaurs, among them two complete brontosaurs—the largest animals that have ever lived—were unearthed from the side of a cliff nine miles north of Jansen, Utah, in what was, in distant ages, a river; as the cobbles, mussel shells and sand environing the bones showed. Besides these specimens of the extinct brontosaurus fossil, remains of several stegosaurus specimens were also brought to light. These are very rare. The stegosaurus was the most grotesque animal that ever existed.

Incomplete remains of a giant diplodocus, like the famous one in the Carnegie Museum, were found with the foregoing.

The research party was in charge of Earl Douglass of the museum staff, one of the men attached to the paleontological department. The party has been in the field for a considerable time, but it is decidedly slow work excavating fossils, as the greatest care must be exercised lest the rocks in which the remains are imbedded be cracked or injured. Then, when the fossils are cut away, there is an immense amount of tedious labor cleaning and assembling them. After that they must be carefully compared with existing specimens to determine whether they form a new genus or species. For these reasons scientists do not know absolutely whether the fossils discovered by the Carnegie Museum men represent hitherto undiscovered specimens. When the rocks bearing the find arrive in Pittsburg this question will be determined.

The skeletons of the strange monsters belong to what are known as sauropoda dinosauria. Sauropoda is a suborder of the herbivorous dinosaurs or land reptiles. At first these sauropoda were carnivorous, that is, flesh-eating animals, but later became herbivorous or herb-eating. The stegosaurus or stegosaurus ungulatus (the ungulata being hoof-footed animals) is always found in Wyoming, in the rocks of certain geological periods. It was a terrestrial reptile, frequenting the huge luxuriant forests prevalent in those days of four million years ago; and browsed on tender vegetation, of which the forests were full.



Model of Stegosaur, Most Grotesque Animal That Ever Lived. Remains of Some of These Great Reptiles Have Just Been Unearthed in Utah

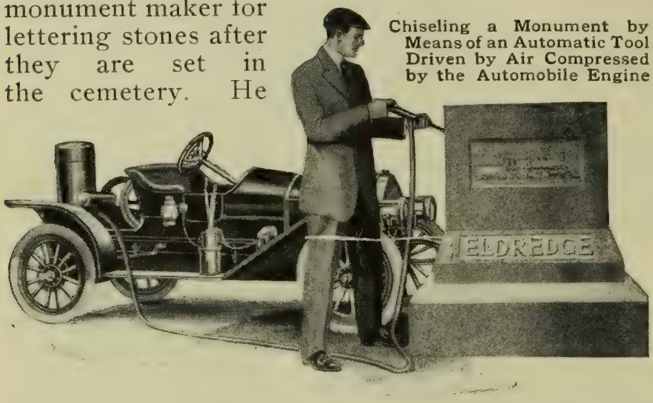
Its most remarkable feature is the double line of large bones sticking up on the middle line of its back; and with which it defended itself against its ferocious carnivorous enemies like the allosaurus. Its tail was armed with spike-like projections with which it impaled its assailants. It fought by presenting its tail and back to its foes, cutting and slashing with those terrible leaf-like bones on its back and those bony daggers in its tail. Scientists say it was a migrant from Europe.

The brontosaurus often attained a length of 80 ft.; but it had a small head. Its neck and tail were short. Like the stegosaurus, it lived by eating succulent herbs. It had powerful legs, 10 ft. or so in length.

The diplodocus specimen in the Carnegie Museum is the only complete one ever found and has attracted world-wide attention. Replicas of it have been presented to half a dozen nations. The diplodocus measured 70 ft. long, had an immense body, powerful legs, and an enormously long tail, and long neck, but a small head. It lived in swamps and ate waterweeds. Its remains have only been found on the slopes of the Rocky Mountains.

AUTO FURNISHES POWER FOR PNEUMATIC TOOL

The accompanying illustration shows an improvised, portable pneumatic granite-cutting plant devised by a monument maker for lettering stones after they are set in the cemetery. He mounted an air compressor on the back of his auto and connected it with the engine of his machine which furnishes ample power for operating the carving tool. Because of rough treatment given memorial stones in shipment, the inventor thought it a better idea to letter or inscribe the memorial after it was placed in the cemetery.



Chiseling a Monument by Means of an Automatic Tool Driven by Air Compressed by the Automobile Engine

"AUTOMOBILE" IN SIAMESE

¶The Siamese word for automobile when printed in the form of a sign has all the appearance of an ad for the black art or some other such mystic performance. The sign usually is:

รถ ยนตร์

THE UTILIZATION OF IRON FILINGS AND SHAVINGS

The iron sweepings from shop floors, not long ago allowed to go to waste, are responsible for a new industry in Germany, represented by about a dozen plants, which has for its sole purpose the shaping of iron filings, shavings, etc., into briquettes. The briquettes go back to the furnaces to be converted again into commercial forms of iron.

Nearly all the plants of the steel industry in Germany send the sweepings from the shop floors to the briquetting plants, and the consignments from the various concerns are kept as carefully separate as the assayer of gold and silver keeps the sweepings and filings from manufacturing jewelers.

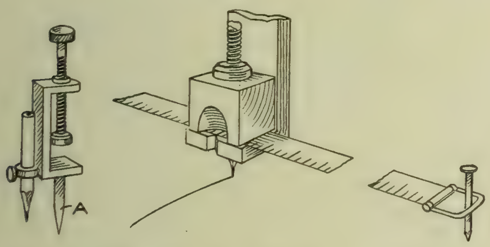
The sweepings are first passed through a strong draft of air, which frees them from dust, including much of the graphite particles contained in cast-iron shavings. Then the sweepings go to the magnetic separator, where brass and bronze particles, as well as the heavier dirt, are removed. After these two cleaning processes, the material arrives at the hopper above the briquetting press, flows down into the empty forms, and is pressed into bricks, which are carried to the loading wagons by a belt conveyor.

¶All horse-drawn carriages used in Burma, India, are equipped with rubber tires and have bells operated by the driver's foot to give warning of approach.

Drawing Circles of Large Diameters

The shop carpenter frequently has occasion to draw curves having a long radius, such as a form for a street-paving crown. These are usually drawn by the use of poles, but on a long radius it is not easy to fasten the poles together to get the length. To do away with the need of a pole, I use the attachment taken from a trammel on a steel tape as shown in the sketch.

The steel point of the trammel A was removed and a V-shaped notch filed in the front part. A small wood block was then fitted as shown and a pencil inserted.



Trammel-Point Part and Manner of Applying It to a Steel Tape

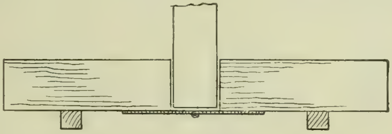
Take the tape and set the V-notch at the desired distance, then drive a nail at the point the radius calls for and proceed to draw the arc.

I have found this a great help and saving of time in my work. An arc can be quickly drawn and the line will be a true curve and not wavy as when drawn with the aid of a pole.—Contributed by H. J. Eccleston, Norwich, New Jersey.

ℭThe jaws on a chuck should be "eased" up before taking the finishing cut.

A Carpenter's Door Holder

When hanging a door I make a clamp by using a 6-in. strap hinge attached to two pieces of 2 by 4-in. material, each about 6 in. long, which are slightly raised by cleats nailed to the under side. The hinge is so attached to the pieces that a space is left between them equal to the width of the door. When the door is placed in the opening, its weight will cause the pieces to grip the edge and hold the door firmly while it is being planed.—Contributed by Eugene Otis, Chase, B. C.



The Weight of the Door Causes the Holder to Grip the Edge Firmly

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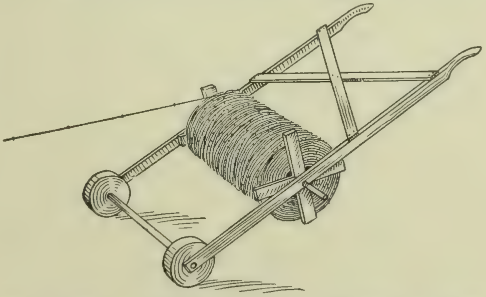
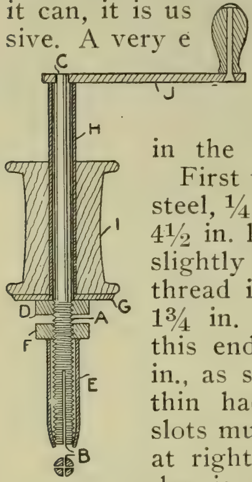
Truck for Spool Fence Wire

In the accompanying illustration is shown a handy rig for carrying a spool of barbed wire when putting up a fence. The manner of construction is obvious. The spool of wire can be easily handled by one man with this device.



Fence-Wire Truck, Similar to a Baggage Truck with a Rod between the Handles for the Spool

A Small-Needle Drill



A hand drill for very small work in metal can rarely be obtained at the hardware or tool-dealer's store, and, if it can, it is usually very expensive. A very efficient drill, that is easily made and costs but little, can be constructed in the following manner: First take a bar of round steel, ¼ in. in diameter and 4½ in. long, taper one end slightly as shown, and thread it for a distance of 1¾ in. Cut two slots in this end to a depth of ¾ in., as shown at B, with a thin hacksaw blade. The slots must cross each other at right angles. A shoulder is filed at the other end of the bar, at C, to receive the crank. An iron or brass nut, D, is screwed on the threaded end and soldered in place.

Procure a brass or iron tube, E, 1 in. long and fitting loosely on the shaft A. One end of this tube is swaged with a light hammer until it is too small to pass over the shaft, and the other end is firmly soldered to a brass or iron nut, F, so that when this nut is screwed upward on the threaded part of the shaft, the swaged end of the tube will force the jaws B tightly together, thus forming the chuck that will hold different-sized drills firmly.

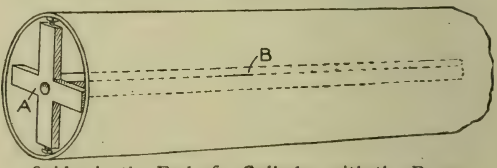
Slip a washer, G, over the other end of the shaft. Procure a piece of brass tubing, H, about 2⅝ in. long, which will fit the shaft loosely enough to allow the latter to turn freely. Slip this on the shaft down to the washer G. This should bring the top of the tube even with the shoulder C. An ordinary darning-cotton spool, I, is now forced tightly on this tube to form the pressure handle.

The crank, J, is made of a piece of iron or brass, ⅛ in. by $\frac{5}{16}$ in., and 2 in. long. A small wood handle is riveted to one end and a hole is cut in the other end to fit over the end of the shaft C. This can be made secure by soldering, taking care to keep the flowing metal away from the tube H, so it will be free.

The drill points are easily made of different-sized needles. Break off the eye, and the point where it starts to taper. Heat and flatten one end until it spreads out on either side, but do not make it too thin. This end is then pointed and sharpened the same as any ordinary flat drill. The shank may be left round, but will be held more firmly in the chuck, if it is made square. The drills should be tempered before using and care should be taken to slightly draw the temper from the shank to keep them from snapping off at this point. When drilling, do not exert too much pressure, as this has a tendency to make the drill bend toward one side or the other.—Contributed by F. L. Matter, Portland, O.

A Spider for Lathe Work

In turning, cutting off, threading, etc., on large pipes or cylindrical work of a like nature, the free end must be supported unless the piece is very short. An old as well as a simple way to hold the end is by means of a spider or casting shaped like a Greek cross, which is tapped at the end of the arms for setscrews and drilled in the center for the lathe center. All this is shown in the sketch, which also illustrates the spider in actual service inside a length of pipe. The other end of the pipe is gripped in the jaws of the chuck.



Spider in the End of a Cylinder with the Brace in Position to Take the End Thrust

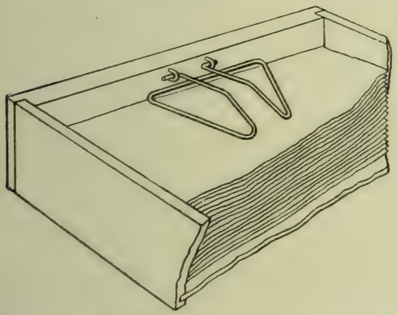
After setting the tailstock center in the hole of the spider, the work is trued up by adjusting the setscrews in or out, as the case may be. The work can be more quickly trued up, if the spider is set approximately true before running the tailstock center into place. Locknuts can be used to hold the setscrews where large work is being turned.

In the sketch, A is the spider, and B is a brace made of wood, which is placed between the spider and the lathe chuck to take the end thrust of the tailstock.—Contributed by Donald A. Hampson, Middletown, N. Y.

A Drawer Paper Protector

An effective device to prevent papers or clothes from becoming creased or torn when opening a drawer is shown in the accompanying sketch.

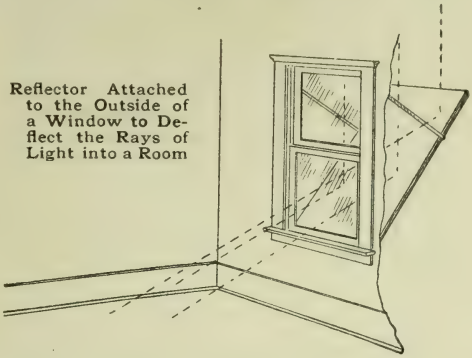
The protector is made of copper wire, about $\frac{5}{32}$ in. in diameter, bent to the shape shown and held in place with two staples. The under side of the wire rests on the paper while the upper part is bent to come in contact with the top of the drawer slide. The protector holds the contents while the drawer is pushed into place. When the drawer is pulled out to remove the papers, the protector, which swings on the two staples, can be swung outside of the drawer where it is out of the way.—Contributed by Frank H. Mayoh, Pawtucket, R. I.



The Protector Holds the Contents While the Drawer is Pushed into Place

A Window Reflector

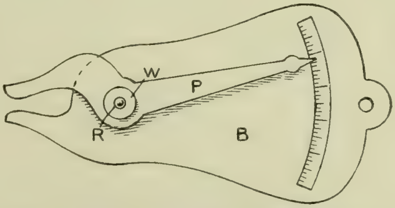
A room having a window opening into a court can be better lighted by making a reflector as shown in the sketch. A mirror is the best reflector, but, if it is considered too expensive, boards painted white will do almost as well. The bottom of the reflector is kept away from the wall so that rain or snow can pass through the opening. This arrangement will reflect the light well and will also prevent persons at other windows in the court from looking into the room.—Contributed by S. Yamashita, Hoquiam, Wash.



Reflector Attached to the Outside of a Window to Deflect the Rays of Light into a Room

Indicating Outside Caliper

The illustration shows how a simple indicating outside caliper may be made. The writer constructed a caliper like this from $\frac{1}{16}$-in. sheet steel, and found it to be very useful in determining the diameter of small rods and wires. Care should be exercised in attaching the pointer P to the main portion, or base, B, to see that there is no lost motion in the joint. A small washer, W, may be placed on each side directly under the head of the rivet R. The scale should be ruled off last, and may be marked to read in fractions or decimal parts of an inch, or both. A second scale giving the gauge numbers will be very convenient in determining the size of wires.—Contributed by R. S. McClure.

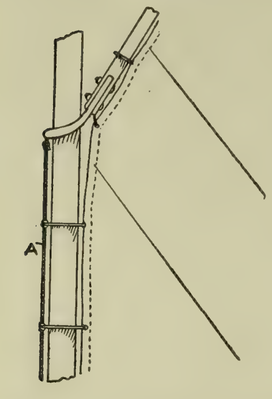


Caliper Made of Sheet Steel for Determining the Size of Small Rods and Wires

ℭA slanting aerial in wireless is not as efficient as the horizontal parallel.

To Prevent the Binding of Mast Hoops

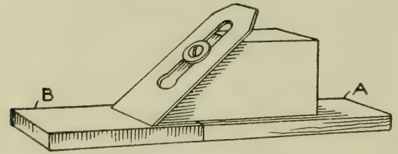
The continual binding of mast hoops against the mast when hoisting a sail may be prevented in the following manner: A stout cord is attached to the gaff jaws and extended down the mast as shown by A in the sketch. Each ring is tied to the cord at its respective distance to hold it horizontal.—Contributed by A. L. Chetlain, Chicago.



Whetting Plane Irons

The accompanying sketch shows a device for obtaining a perfect cutting edge on plane irons or chisels, which is almost impossible to secure by the most experienced mechanic in the usual way of sharpening by hand without a guide.

The device is very simple and may be easily made by anyone with little experience, it simply consisting of a piece of pine board, A, of the same thickness as the stone B, and a pine block cut at any desired angle or bevel in which a wood screw with a washer is placed to hold the plane iron. A chisel can be held with a screw on each side of the blade. A little paraffin used on the two rubbing surfaces of the wood parts will give good action without friction.



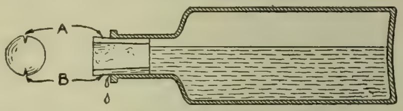
Plane Iron on a Block Having the Proper Slope for the Angle of the Edge

When the fine feather shows on the cutting edge of a tool treated on this device, it is better to use a small hand stone or a smooth steel instrument to turn it back than to attempt to reverse the whole block with tool attached, it being rather awkward to handle. The former method also eliminates the danger of rounding off the straight edge of the tool more or less.—Contributed by Herman Lindenberg, Jr., W. Hoboken, N. J.

Simple Medicine Dropper

When a medicine dropper is not at hand or when it is desirable for any reason to drop the medicine directly from the bottle, a very efficient dropper may be made from an ordinary cork stopper in the following manner: Cut two small grooves lengthwise of the cork opposite to each other. When using, hold the bottle in such a way that the air will enter one of the grooves, A, and the medicine will drop out of the other, B.

The size of the grooves will depend upon the character of the liquid in the bottle. Alcoholic and light aqueous solutions require very small grooves, while for syrups and oils they must be made somewhat larger.—Contributed by W. C. Lane, N. Wilkesboro, N. C.



Two Grooves in a Cork, One for the Vent and One for the Fluid

Repairing a Crack in Cast-Iron Pipe

A crack in a cast-iron pipe or a gasoline-engine cylinder, caused by freezing, can be repaired in the following manner, if the pressure the part has to withstand is not too great. Procure some sulphate of copper, commonly known as bluestone, and dissolve it in water. Clean the edges of the crack well with a file or sandpaper. Paint the iron with the solution several times until there is a coat of copper on it. The copper surface can be easily soft soldered, which will produce a satisfactory repair in many cases.—Contributed by Wm. W. Grant, Calgary, Can.

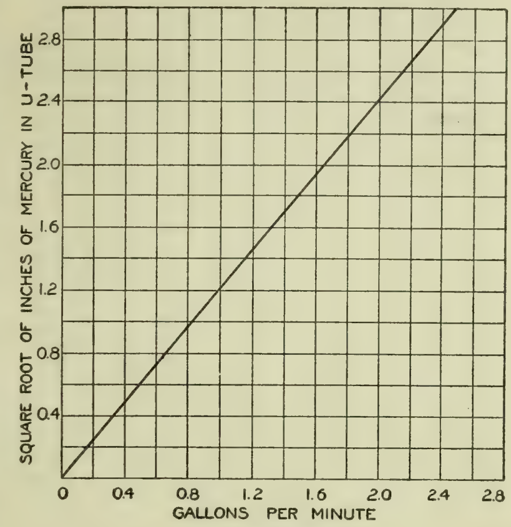
Measuring Water without a Meter

The amount of feed water pumped into a boiler is a point of interest to the engineer, says Power. If there is a water meter in the pipe line, this may be determined, but such an instrument is never correct and the reading must be multiplied with a certain coëfficient in order to give the actual flow of water. To render the situation still more difficult, this coëfficient varies with the speed of the meter and also with its age.

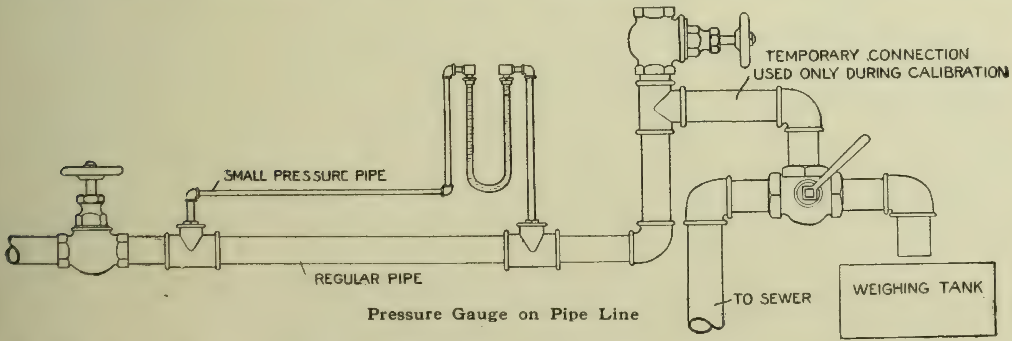
Assume that a 50-ft. pipe line is supplying a boiler with water. The amount of water flowing through the pipe may be determined in the following manner: Attach a ⅛-in. iron pipe in the far end of the supply pipe, as shown in the sketch by the small pressure pipe. Run this small pipe along the larger one to any convenient point near the boiler or other outlet, and connect it to a U-tube having a scale graduated in inches. Also connect the opposite end of the U-tube to the supply pipe and fill the bend half full of mercury.

When water is flowing in the supply pipe there will be a difference in pressure between the points where the small pressure pipe is connected to the supply pipe, causing the mercury to be elevated in one leg of the U-tube and depressed in the other. This pressure difference varies with the velocity of flow, and it is this fact which makes it possible to determine the volume of water passing through the pipe.

The arrangement must be calibrated, which means maintaining the difference in pressures constant for a definite period, say 10 min., during which time the water is collected in a barrel and afterward weighed. For this purpose cut in at some point in the supply pipe back of the U-shaped tube and put in a tee as shown. This temporary connection is supplied with a three-way valve which is used so that, while the desired difference in pressure is being obtained, the water may be flowing through one opening of the three-way valve and into the sewer. When the desired pressures are secured, the handle of the three-way valve may be turned and the stream discharged into the empty barrel which has been pre-



Curve Diagram



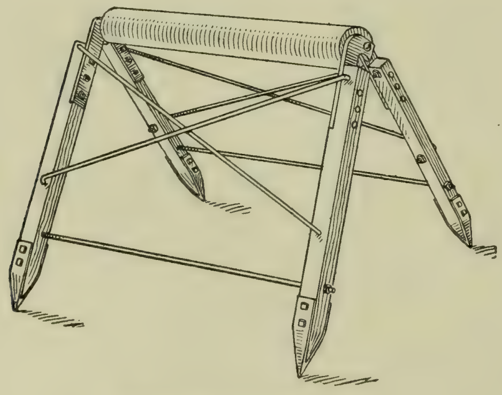
Pressure Gauge on Pipe Line

viously weighed. At the end of the 10-min. interval, the three-way-valve handle is again turned, and the stream directed into the sewer. In this way a number of different pressures are taken and the water collected for each. The results should be plotted as shown in the curve diagram.

Such an arrangement is not only inexpensive, but has, besides, the great advantage that, when once calibrated, it may be depended upon for accuracy at all times. Another feature is that it is not affected by hot or dirty water, or by chemicals. The distance between the points of connection of the small pressure pipe on the supply pipe should not be less than 25 ft., but need not necessarily be straight.

Adjustable Horse for the Shop

Two necessary points in the construction of an adjustable horse are the ease of adjustment and the rigidity of the base. In most cases one is sacrificed for the other. The accompanying sketch shows the construction of about as handy an arrangement for general use as can be made for a woodworking shop. There are no parts with setscrews to come loose and allow the work to fall. The jack is instantly set and, because of the extent of the base, it remains where set under a load, regardless of the tendency to tip as the work is moved either way over the roller.—Contributed by F. W. Bently, Huron, S. D.



Roller with Adjustable Legs

Tempering Small Articles Evenly

It is quite difficult to temper a lot of small springs or other small articles and have the temper equal in all parts of each piece. The following process will be found to give an equal temper in every part of each article:

Obtain a small cup which is pressed from one piece of metal or a pieced cup with hard-soldered seams. Partly fill the cup with some animal or fish oil. Petroleum products are not good on account of their volatility.

The articles are heated to the usual color and plunged into the cup, which is to have sufficient oil in it to cover them. After being thus hardened, the cup with the oil and the articles is held over the fire until the oil takes fire and burns. After the temper has been drawn sufficiently, the cup is removed from the heat and a cover placed over it to quench the flames. When cool, the articles are removed. The articles will be found evenly tempered.

In tempering springs I usually allow the oil to burn about six minutes before quenching. As the oil can be heated to only a certain temperature, the articles receive a perfectly even heat. If the oil is burned off from the article while it is only smeared with oil, some parts will be heated more than others. If a spring is made of piano wire, it will be greatly stiffened and improved by heating it to an even blue after it is formed. The reason for this is that when the wire is coiled the metal is full of strains which the heat removes.—Contributed by J. H. Beebee, Rochester, N. Y.

Gasoline Spray for Cleaning Machinery Parts

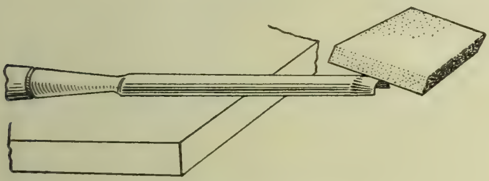
In cleaning and repairing the machinery of an automobile, gasoline is used to cut out the thick and dirty lubricating oils in bearings. It is often difficult to get the gasoline into certain places to be cleaned, and this has brought out a syringe device for use in such places.

While cleaning some computing

scales, I desired to remove some oil and dirt from the parts, and the syringe idea obtained from the automobile-cleaning device led me to try out an ordinary blowtorch I had at hand. When I desired to use the gasoline for cleaning, I opened the valve and allowed a fine stream to squirt out, which was easily directed to the spot to be cleaned.—Contributed by Robert S. Cheney, Ashtabula, O.

How to Sharpen a Gouge

Place the gouge on the bench with the back up and the cutting edge extending about 3 in. over the edge of the table. Apply the whetstone with the right hand while holding the gouge level with the left; rub the stone back and forth at right angles to the gouge and at the same time roll it around the curve of the gouge. This method will take out nicks when using a coarse stone and also keep the cutting edge straight, which is difficult to do on a grindstone. A few strokes of a fine stone in the usual way will produce a good edge.—Contributed by L. R. Kelley, Philadelphia, Pa.



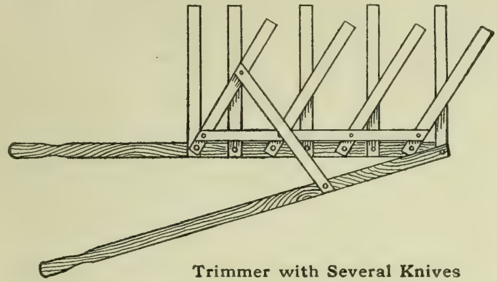
Whetting a Gouge

Self-Adjusting Belt Tightener

A small grinding machine, having two pulleys side by side for changing the speed, was run by a round belt. The belt was always loose on one pulley and tight on the other, and the belt would stretch so that it would slip. This was easily remedied by cutting out a piece of the belt about 5 in. long, and putting in a piece of coil spring a little shorter than the leather taken out. This spring keeps the belt tight on both pulleys.—Contributed by Newcomb D. Hollister, Truston, New Jersey.

A Hedge Trimmer

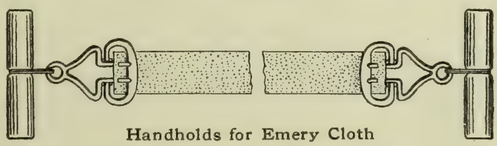
Hedge cutting or trimming with a sickle or with hand snips is very slow and tedious work. As I had considerable hedge to take care of, I made a trimmer with several sets of blades similar to a regular trimmer. The blades were attached to a wood handle and operated with a wood lever as shown in the sketch. The operation is the same as when using the regular hedge trimmer.—Contributed by Herman Krouskoff, New Rochelle, N. Y.



Trimmer with Several Knives

Emery-Cloth Holder

As I had a number of dirty connecting rods to polish I naturally set about to do the work as quickly as possible and with the least exertion. Emery cloth is hard to hold with the fingers and keep flat on the rod. I procured two overall buckles and attached a round piece of wood to each buckle, with a cord. A strip of emery was placed in the buckles just as a strap. The device saved me considerable time, and I could put on a better polish than when I held the emery cloth by hand.—Contributed by Wm. Schumann, New York City.

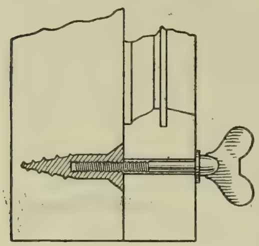


Handholds for Emery Cloth

ℭOne of the objections to painting interiors with zinc white is that it will crack or scale, but, according to a Danish painter, this can be remedied by adding 10 per cent of whiting.

Fastener for Window Screens

An ordinary wood screw does not make a good fastening for screens, blinds, shutters and storm windows, as the wood around the threads will become worn as the screw is removed and replaced. A good holding device is made of a short wood screw having a large diameter into which a hole is drilled and tapped to take a thumbscrew of standard threads.



The wood screw is turned permanently into the window or door facing. The holes in the frame are bored to coincide with the threaded holes in the wood screws. It is an easy matter to turn the thumbscrew in place.—Contributed by W. C. Terry, Boston, Mass.

Removing Inner Band on Truck Wheels

Motor-truck builders and blacksmiths, in rebuilding truck wheels that have two bands, will find it a difficult matter to remove the inner band by heating, as both bands will expand alike, causing them to remain tightly together.

If it is desired to use one of these bands after the wheel is rebuilt, it will be a very easy matter to remove the inner band by driving a wedge between the two as shown in Fig. 1, making the opening the same all the way through. Stand the bands up and leave the wedge between them and strike the metal at A A with the peen end of a sledge hammer. A few blows will cause the inner band to come loose. The band can then be heated and straightened.—Contributed by James E. Roy, Philadelphia, Pa.

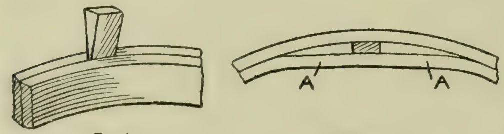


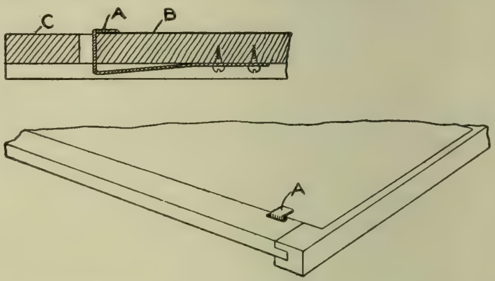
Fig. 1 Fig. 2

Driving the Wedge between the Bands, and Location for Striking the Inner One

Substitute for Thumb Tacks

In making patent drawings, or when a number of small drawings of the same size are to be made, I have found the attachment shown in the sketch to be a splendid substitute for thumb tacks. A drawing board on which thumb tacks are used soon gets full of holes and becomes useless.

The bent end A of the spring clip clamps the paper B by the pressure of the spring. The spring is fastened to the under side of the drawing board C with two screws. A pressure of the finger on the under side of the clip raises it for the insertion of the paper.—Contributed by Chester E. Warner, Kalamazoo, Mich.



Spring Clips Used on a Board to Hold Drawing Paper of Uniform Size

Preserving Surplus Stain when Staining Shingles

It is almost impossible to stain shingles without waste of staining liquid. To reduce this waste as much as possible, we used an old clothes wringer, attached to a tub, for pressing out all surplus stain at the time the shingles were dipped. As our washing machine and wringer were driven by electric motor, the latter was belted to the old wringer to drive it, while the shingles were fed into the rolls. A better job resulted when the large end of the shingles were started in first.—Contributed by Geo. Lindsay, Manitou Springs, Colo.

Tile Sewer Construction

By GEORGE M. PETERSEN

PART I

The construction of the different kinds of municipal improvements, such as sewers, streets, culverts, highway bridges, etc., are but vaguely understood by the average man. It is the purpose of this description to give facts from a practical view point so that such of the younger generation that are so inclined may obtain a good knowledge of the proper methods of doing this work, and be enabled to join the army of construction men with an amount of practical knowledge which is seldom attained except by experience.

Tile Sewers

In modern sewer construction there are several different classes of material used; the principal ones being brick, stone and concrete, for trunk sewers, while tile is used for branch or service construction. Tile is, however, generally used on small trunk sewers up to 2½ or 3 ft. in diameter. For large trunk sewers, brick is the most common material, the walls being built up of two courses. Stone inverts or bottoms and brick arches are also used on large trunks while reinforced concrete is used for short drainage sewers and culverts. As it is the object of this article to deal only with the construction of tile sewers, a few points bearing on the tile may not come amiss. Tile sewers have a carrying capacity of 100 per cent more than brick sewers of the same size, and the table herewith shows the rate of discharge for the various sized tile at different grades. Sewer tile is made in sizes from 3 in. to 36 in. in diameter and in "standard" and "double"

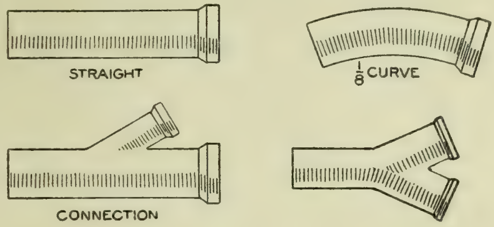


FIG. I

Four Forms of Sewer Tile for Laying Straight Mains, Turning Corners and Making House Connections

CARRYING CAPACITY OF SEWER PIPE

Size of Pipe in Inches	GALLONS DISCHARGE PER MINUTE							
	1 Inch Fall per 100 Ft.	2 Inch Fall per 100 Ft.	3 Inch Fall per 100 Ft.	6 Inch Fall per 100 Ft.	9 Inch Fall per 100 Ft.	1 Foot Fall per 100 Ft.	2 Foot Fall per 100 Ft.	3 Foot Fall per 100 Ft.
3	9	12	15	22	27	31	44	54
4	20	28	35	50	62	71	101	124
6	63	89	111	156	194	224	317	389
8	140	198	246	348	432	499	706	864
9	196	277	339	480	595	687	971	1180
10	261	369	457	648	803	928	1310	1610
12	432	612	758	1070	1330	1530	2170	2660
15	800	1130	1400	1980	2450	2830	4010	4910
18	1320	1860	2310	3260	4040	4660	6590	8080
20	1720	2500	3060	4330	5305	6130	8660	10610
24	2910	4110	5035	7191	8810	10270	14520	17790
27	4020	5680	6960	9840	12050	13920	19680	24110
30	5380	7618	9320	13180	16140	18640	26350	32280
33	6950	9840	12050	17040	20865	24090	34070	41730
36	8800	12450	15210	21565	26410	30500	43130	52820

Carrying Capacity of Brick Sewers = 50% of Above Quantities.

strength. The standard is usual for tile up to 15 in. in diameter, and double strength for larger sizes. Under extreme conditions double strength is sometimes used throughout. Sewer tile is made in forms, known as "straight," curves, connections and Y's, and shown in Fig. 1. Other shapes are made, but are seldom used.

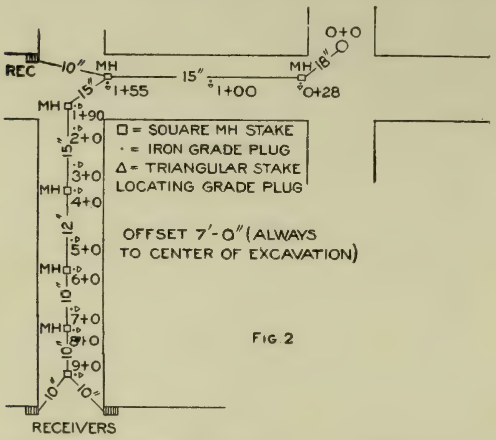


Fig. 2

The Layout Showing Depth of Cut Made by an Engineering Crew for a Street Sewer

Laying Out the Grade

The first step in the construction of any sewer is to obtain the grade, or fall. The method of determining this is as follows: The engineering crew first lays out the center line for the sewer and drives stakes at an "offset." The offset is usually from 5 ft. to 10 ft. from the edge of the proposed trench, although all offsets are figured from the center. Triangular stakes are usually used to mark the offset line and locate the grade plugs. When turning corners the stakes and plugs are set at the angles without regard to the distance, but on a straight run the stakes are placed on the even 100 ft. Each stake driven is called a station and marked as follows: 0 + 27, which means 27 ft. from the start, 1 + 89 means 189 ft. from the start, etc.; the number preceding the plus sign indicating hundreds, and the number following, the odd feet. After the stakes and grade plugs are driven, the manholes are laid out, and a square stake marked M-H is driven in the center of the manhole. As the location can never be exactly right, a few inches or even 1 or 2 ft. change in location will not cause any trouble. The layout of the sewer would appear as shown in Fig. 2.

The grade plug is usually a 5/8-in. round iron rod about 1½ ft. in length and is driven in nearly flush with the surface of the ground about 2 in. in front of the triangular stake. After all these stakes and plugs are placed, the levelman takes a level of all the plugs. The engineers then figure out the grade of the sewer and make up a list of "cuts" to be made at each station or plug. A list of cuts would appear as shown in the following table:

Station 0 + 0	Cut 8 ft. 6½ in.
Station 0 + 28	Cut 8 ft. 5 in.
Station 1 + 0	Cut 7 ft. 11 in.
Station 1 + 55	Cut 8 ft. 3 in.
Station 1 + 90	Cut 8 ft. 7 in.
Station 2 + 0	Cut 8 ft. 4 in.
Station 3 + 0	Cut 8 ft. 2 in.
Station 4 + 0	Cut 8 ft. 10 in.
Station 5 + 0	Cut 9 ft. 3 in.

It will be readily seen that while 0 + 0 is actually the deepest point of the sewer, a steady rise being made from 0 + 0 to the far end, the cut is not as heavy as at station 4 + 0. This is often the case and one should not get confused if he seems to be going downward at the far end. If, however, the tile appears to be flat or with a dip toward the upper end, a level placed upon it will quickly show the actual condition.

After obtaining the list of cuts, make up a sight rod as shown in Fig. 3. As the deepest cut in the list is at station 5 + 0 the rod must be made accordingly. The cut being 9 ft. 3 in., the rod should be about 5 or 6 ft. longer, and a crosspiece fastened at the 13-ft. mark after the shoe is attached. Next a stake is driven into the earth di-

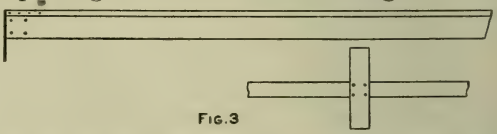


Fig. 3

The Sight Rod, with Shoe and Crosspiece, Used for Leveling Tile in Starting a Run rectly out from the grading plug and from 4 to 5 ft. from the edge of the proposed excavation. These stakes should be made of 2 by 4-in. material, 8 ft. long, which should be pointed at one end. These are always driven in pairs as shown in Fig. 4. These pairs are called rangers. As the rangers must be set at a height of 13 ft., the "cut" must be subtracted from the 13 ft. and the crosshead attached. For example, set the rangers at station 0 + 0 and station 0 + 28. As the cut at station 0 + 0 is 8 ft. 6½ in., and this subtracted from the 13 ft. leaves 4 ft. 5½ in., a straightedge is marked 4 ft. 5½ in. and set upon the grade plug. Another straightedge and a level are used to transfer the 4 ft. 5½ in. mark over on the upright without error. A crosspiece, about 10 or 12 ft. long, ⅞ in. thick and 6 in. wide, is now placed flush with the mark and fastened with a screw clamp. The straightedge is leveled and the other clamp attached. The complete ranger with crosshead is shown in Fig. 4. At station 0 + 28 the cut is 8 ft. 5 in., which subtracted from 13 ft., leaves a remainder of 4 ft. 7 in., or the distance for the marks above the plug. The rangers should always be checked by sighting over several of them together. It is good practice to have two or three rangers set ahead and leave one or two in the rear of the work. This allows four or five rangers in line all the time and affords an excellent check before starting the work in the morning by sighting all of them before commencing work. A variation of 6 in. is permissible and is very liable to creep in. One can never be too careful about setting rangers as exactly as possible.

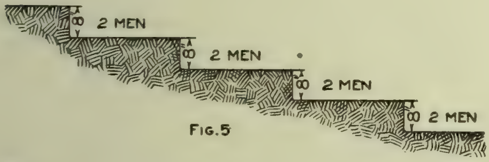


Fig.5

The Men are Located on Stations and Dig the Depth of the Spade on Each One

Excavating

The excavation should always begin from the lower or deeper end and work up grade. The best way to excavate for a big, wide, deepcut sewer is with a mechanical trench digger or even a steam shovel. On small jobs or in isolated districts, however, when the job will not warrant the additional cost of transportation and running expenses of the machinery, the excavation may be done by hand. There is a difference of opinion as to the best methods of doing this work. The one described is the one most used.

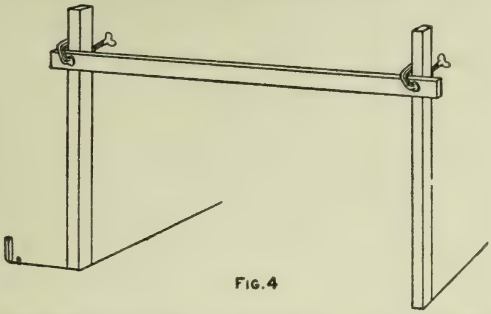


Fig.4

Two Stakes are Set over the Location of the Trench and Called Rangers

The width of the trench must be first determined. This is governed by the size of the tile to be used and the depth of the excavation. For the job outlined, a trench should be dug about 30 in. wide for 18-in. tile; 24 in wide for 15-in. tile; 23 in. wide for 12-in. tile, and 20 in. wide for 10-in. tile.

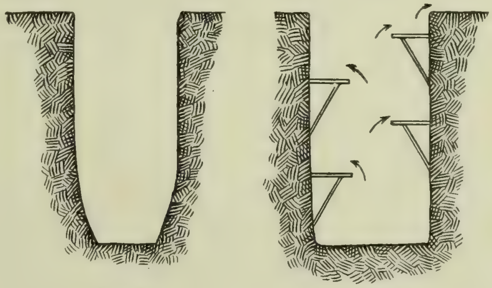


Fig.6 Fig.7

A Trench Narrowed at the Bottom, and Manner of Relaying Earth in a Deep Excavation

Lay out the sides of the trench and run lines along both sides as guides for the laborers so that they may excavate straight and true. The trench is marked out by two men following the line and picking a small line in the earth with a pickax. Divide 200 or 300 ft. of the trench marked out into spaces of 20 ft. each and set a small stake. Place two men to work in each 20-ft. space. They should start the trench by working straight down to the bottom. Two men working a 20-ft. section are as good as four men working 10-ft. sections alone. Working in the manner described requires only one-half the number of pickaxes, and having more room, the laborers can naturally work faster and to better advantage. Each laborer can change from shovel to pick at half-hour intervals and do more work with less exertion. After the excavation is down to within about 4 in. of the true grade, the men are started ahead in pairs and work along as shown in Fig. 5, each pair taking a certain cut from 8 to 12 in. and working straight through on that level to the end of the entire excavation. This style of excavating is what is termed "progressive ditching."

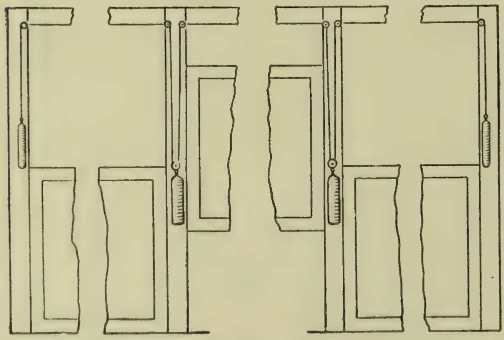
The sides of the trench must be watched very closely as laborers have a tendency to "pull" the sides at the bottom, as shown in Fig. 6. A laborer should be stationed about every 100 ft. on top of the trench after it has reached a depth of about 3½ ft., to turn back the excavated earth and maintain a narrow pathway about 20 in. wide along the edge of the trench on both sides. This path is to allow for inspection of the trench and also to facilitate the handing of pipe and materials into the trench without knocking the excavated earth back into the trench. When excavating to a great depth by hand the trench must be wide enough to admit scaffolds on which the earth can be relayed to the surface as shown in Fig. 7.

The 4 in. of earth which remains at the bottom of the ditch are removed by the tile layer or an experienced man who immediately precedes him. If excavated by the tile layer, the earth is thrown over his head onto the tile already laid, thereby "backfilling" the trench without throwing the earth all the way out and then back. It is advisable, and in fact given in almost all specifications, to keep the excavating gang not more than 200 ft. ahead of the tile layers on account of the danger of the banks drying and caving in and filling the trench.

(*To be continued.*)

Weighting Triple Doors or Windows

In remodeling an old front, where there was not sufficient room between the center stiles for weights, I used the following method of weighting them. The doors were of heavy mesh wire and weighed 75 lb. each.



Each Center Stile has One Large Weight Which is Equalized by a Pulley and Rope

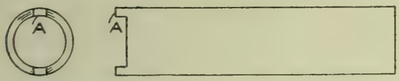
I used regulation weights on the outside of each outside door in the usual manner, and weighted the adjoining edges of both center and outside doors with one weight of 40 lb. in each stile, the weight being hung on an awning pulley swung on one rope, to equalize the weight on the doors.—Contributed by F. E. Brown, Los Angeles, Cal.

Blue Letters on Steel Surfaces

The steel is heated until blue, then the letters are applied by painting in oil colors with a small brush. As soon as the color is dry the steel is immersed in strong vinegar. The blue will disappear on all the uncovered surface. The paint is then removed with a piece of soft rag dipped in turpentine. The protected parts will show the blue color obtained by the heat.

Substitute Spanner Wrench

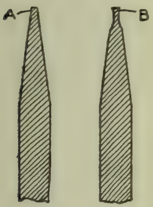
Many times when we have had a job that called for a spanner wrench, none of the proper size was available. I have overcome this difficulty by making a temporary spanner of a short length of pipe having the proper diameter, and cutting the end with a hacksaw to make the projections. This will remove the nut without injuring it in any way.—Contributed by Jas. S, Frear, Sidney, N. Y.



When Necessary a Spanner Wrench can be Cut on the End of a Piece of Pipe

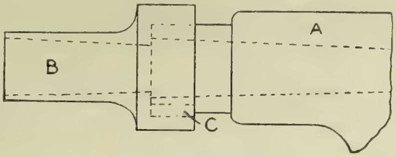
Proper Shape of a Screwdriver Blade

All screwdriver blades are formed wedge-shaped as shown at A. When turning large or stubborn screws the blade has a tendency to climb out of the slot which results in damaging the screw head. The best way to overcome this trouble is to shape the blade as shown at B. The metal is slightly hollowed out, back of the edge, with a rat-tail file. When shaped in this manner, it requires no downward thrust to keep the blade in the screw slot.



An Auxiliary Drill Holder

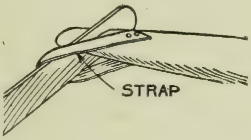
It often happens that the taper hole in the spindle of a lathe is not a standard taper, so that the drill shank will not fit properly. This can be easily remedied by making an auxiliary drill holder to fit the end of the spindle and having a standard taper hole for the drill shanks. The end of the holder is bored out sufficiently to fit over the end of the spindle in A, and a key, C, the same width as the key in the spindle, is put into it. The key prevents the holder from turning around and the holder can be slipped off and on the end without any trouble. The taper B is the same as for standard taper-shank drills. —Contributed by Chas. Homewood, Waterloo, Ia.



The Auxiliary Holder is Fastened on the End of the Tailstock Spindle

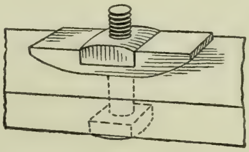
Tug Holder for a Singletree

Tugs on light harness to draw buggies have slots in their ends which slip over the ends of the singletrees. These are apt to slip off when going down an incline unless something is provided to keep the tug end in place. A good way to do this is to attach a piece of leather strap to the wood as shown in the sketch. In hitching up, the tug is run through the strap loop and slipped on the singletree end.



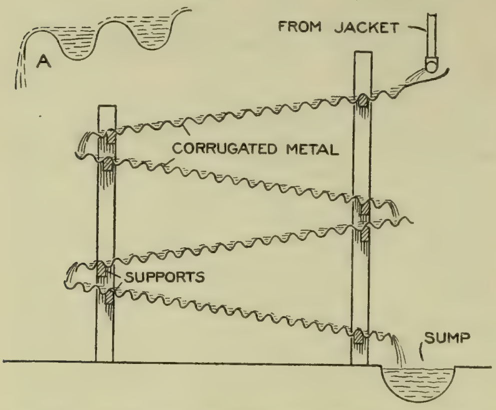
Homemade Thumbnut

A great many times a thumbnut is required when none is at hand. One can be quickly made in the following manner: Use an ordinary nut and make a wood button to fit over it, as shown in the sketch. In many places this will answer the purpose as well as the regular thumbnut.—Contributed by A. S. Thomas, Gordon, Ont.



Cooling Engine Jacket Water

Frequently the supply of water for cooling a gas engine is limited or is expensive, and it is desirable to have some means of cooling the water so that it can be used repeatedly. A correspondent of the Gas Engine presents a method which he used, in connection with a 30-hp. suction producer plant, to replace the tanks which are sometimes utilized for cooling the water by natural circulation.



The Water Running over the Successive Corrugations of the Sheet Metal is Readily Cooled

The indicated horsepower was 40, and as it requires 5 gal. of water for each horsepower, this involved the use of 200 gal. of water an hour. Four old sheets of corrugated iron, each 20 by 8 ft., were secured from a junk heap and were erected as a series of inclined shelves, as indicated in the sectional sketch. Timber work was used as supports, the jacket water being sprayed on the topmost sheet from a pipe extending the full width of the sheet. In this pipe 36 holes, $\frac{1}{16}$-in. in diameter, were drilled at equal distances apart along its whole length. The water runs over the different sheets successively, as shown, and finally falls into a cement sump, from which it is pumped to the engine jacket.

Sheets with deep corrugations are found to be more satisfactory, as they retain the water for a longer time, and can be set at a steeper angle. The sheets are spiked to the timbers, and each spike head should be surrounded and covered with cement to prevent the water from dripping through and rotting the timbers. Each sheet should be cut so that it begins, at the upper end, with the concave part of the corrugation and ends, at the lower, with a convex part, as at A, thus causing the water to drop off the edge without backing up on the under side of the sheet.

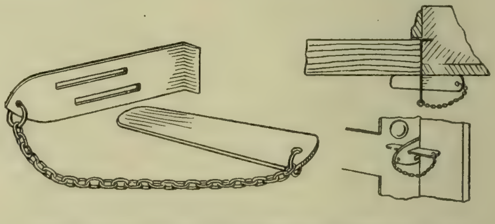
Shop Signal for the Beltman or Electrician

Being in charge of the maintenance department in a large manufacturing plant, I experienced a great deal of trouble when wishing to find the beltman or electrician in a hurry. At times there would be two or three boys running around the plant looking for them.

I have been trying a new plan for the past year and found it much better. Two lights of different colors are placed in the center of the largest shop so they can be seen from almost any part of the place. The lights are turned on and a note giving instructions hung on a nail. Any number of lights can be installed in different parts of the shop where they may be easily seen.—Contributed by H. D. Harper, St. Louis, Mo.

An Emergency Lock

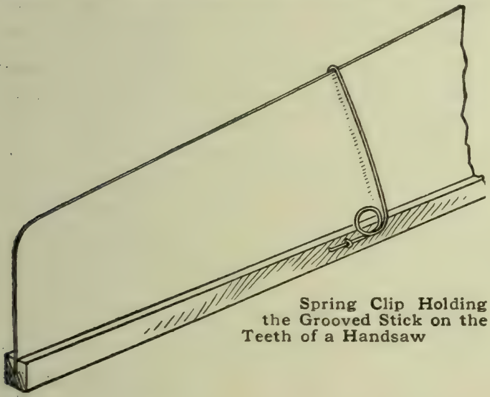
The ordinary door lock of the average hotel room cannot be depended upon for holding the door against intruders. The lock shown in the accompanying sketch makes it possible for the traveler to lock his door securely. The lock is made of two pieces



The Lock for Use in Emergency Cases and Its Application to Any Door of sheet steel, formed as shown and fastened together with a small chain, so one part cannot be lost from the other. The manner of using the lock is clearly shown.—Contributed by George V. Sheridan, Brooklyn, N. Y.

Shield to Protect Handsaw Teeth in a Tool Chest

The shield is made of a small grooved stick of wood with a spring attached to hold it on the saw teeth. The spring is made of wire of the proper length with a coil at each end and fastened to the sides of the wood stick. The illustration shows the stick and spring, and the manner of attaching the device to the saw.


Spring Clip Holding the Grooved Stick on the Teeth of a Handsaw

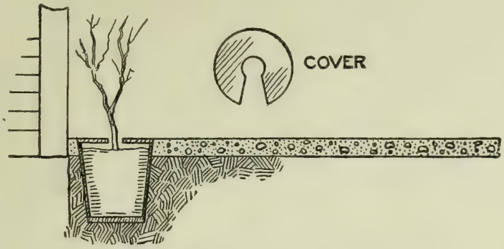
The guard can be slipped on and off easily by pressing the spring forward with the thumb.—Contributed by J. H. De Lamatter, Aurora, Ill.

Waterproofing Blueprints

Immerse in melted paraffin until saturated a number of pieces of an absorbent cloth, 1 ft. or more square. When withdrawn and cooled they are ready for use at any time, says Railway and Locomotive Engineering. To apply to a blueprint, spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flatiron. The paper immediately absorbs paraffin until saturated, and becomes translucent and completely waterproof.

Plant Pot in Cement Sidewalk

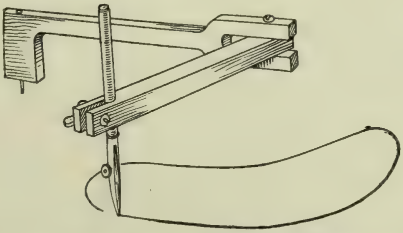
The pot holding a plant or vine at the entrance of a residence in a crowded city is usually in the way, and when the plant is watered the walks become wet. The illustration shows a good, cleanly way of arranging a pot or keg in the walk, so that it is out of sight, and the seeping water will be taken up by the earth. A cover may be made for the pot as shown.



The Pot Being Placed in the Earth Keeps All Dampness Away from the Walk

Ruling-Pen Holder for Tracing Irregular Curves

Tracing indicator diagrams free-hand with a writing pen makes uneven lines of irregular thickness. Using the ruling pen free-hand is difficult because it is necessary to keep it turning in the fingers. This attachment holds the pen steady while the fingers can revolve it with ease as the point traces around the curves of the diagram. The construction can be readily understood from the sketch. A sharp-pointed nail forms the pivot point, and a screw in the split end of the arm is used to adjust the rigidity of the pen.—Contributed by J. J. O'Brien, Buffalo, N. Y.


The Arm Holds the Pen Steady While It can be Turned by the Fingers

Special Molding Jobs from Standard Patterns

In a small shop having a varied stock of standard patterns the "stopping off" and "building on" in molds are necessary on all special jobs. The patterns must be utilized as far as possible without changing them from the standard, and with a minimum of pattern work. In making changes, pieces for stopping off and building on are always used when conditions favor, and thus stock patterns are adapted to the needs of the hour with little change in their original form.

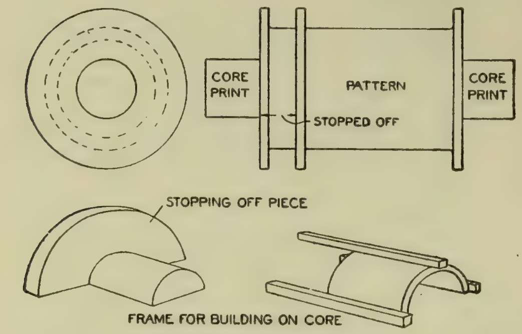


Fig. 1—Cylinder Pattern

In Fig. 1 is shown a cylinder pattern with flanges on both ends and a chambered core. To shorten this cylinder, a flange is fitted around the barrel to make it the correct length and a stopping-off piece used. This is a half flange with core print attached, and is used by the molder in filling in that part of the mold not required for the casting. The large part of the core is shortened by filling in the core box.

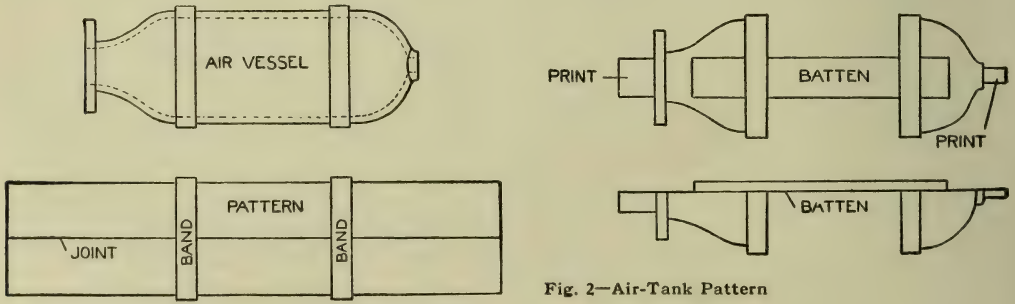


Fig. 2—Air-Tank Pattern

Such a pattern is lengthened by moving the flange out the required distance and filling in the intervening space to correspond with the barrel of the cylinder. If this space between the flanges is great enough to allow the sand to "stand" when the pattern is drawn, no stopping-off piece is used, but if there is not sand enough, or it is liable to "tear up" on the "draw," the stopping-off piece will be necessary. In extending the cylinder, the large part of the core must be lengthened as required. This is done with the frame for that purpose, before the cores are dried. The head of this frame, to which the three rails are attached with screws as shown, is made to fit over the small part of the core, while its outside diameter equals that of the larger part. When the frame is placed on, and brought flush with the end of the core, there should be a space between the inner side of the head and the large part of the core, which, when filled in, will make it the correct length. A small air tank is shown in Fig. 2, having a hemispherical end, stopped

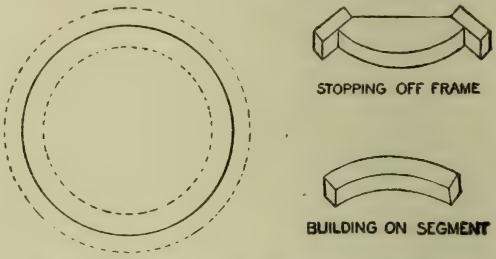


Fig. 3—Increasing or Decreasing Circular Plates

from a piece of straight pipe or column. The only addition to this pattern is the bands that strengthen the casting and also serve as a guide for the stopping-off piece. This is made, as the sketch shows, with two end pieces connected with a batten. This method can be easily used and the pattern adjusted to make tanks of different lengths.

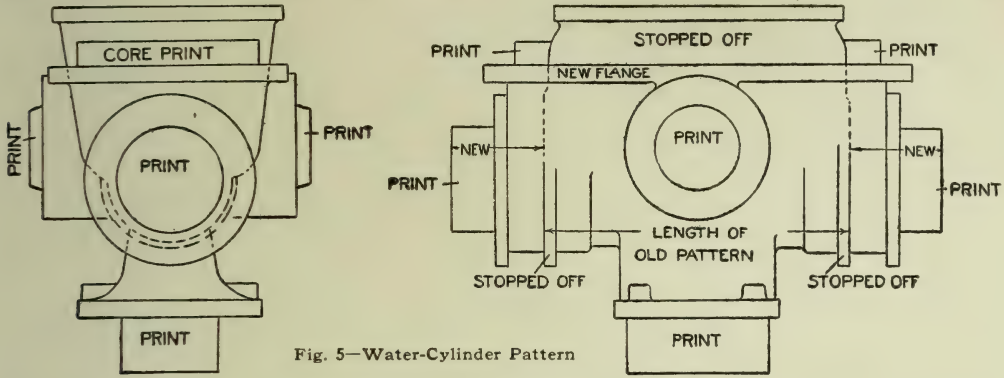


Fig. 5—Water-Cylinder Pattern

Circular plates, cylinder heads, flywheels, etc., are increased or decreased in diameter as shown in Fig. 3. The black line shows the diameter of the plate pattern, while the dotted lines indicate the diameters to be stopped off or built on to produce the size required. The stopping-off segment is of a radius to correspond to the diameter of the plate required. The segment has end pieces attached to it for easy removal and to space equally all around the part to be filled in with sand. The end pieces are removed and the segment used without them while filling in the spaces left in the sand between the parts previously finished.

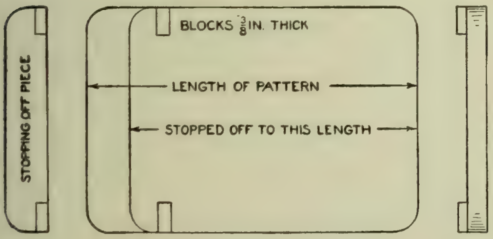


Fig. 4—Rectangular Plates

A round hole is increased in diameter with a frame the reverse of the one shown. The segment for increasing the diameter of the plate is used while the pattern is in the sand. The sand around the pattern is either dug away to accommodate the segment or a level bed "struck up" and the diameter "rammed up" afterward. When increasing the diameter of a flywheel, where the inside of the rim provides a guide, a suitable segment is used after the pattern has been drawn.

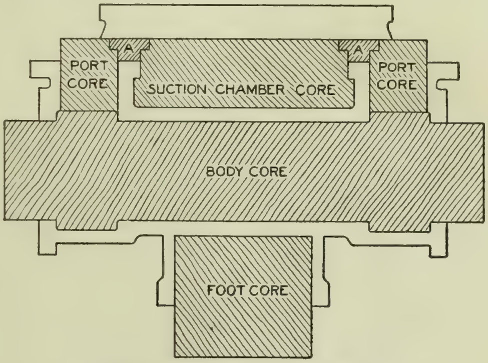
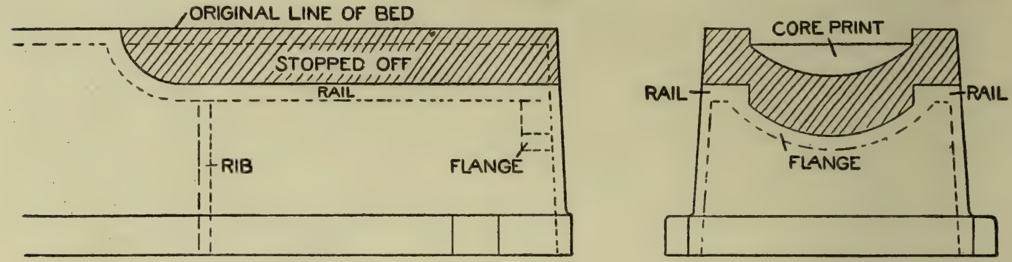


Fig. 6—Section through Mold

In stopping off a square or rectangular plate, where there is nothing to locate the stopping-off piece, blocks, ⅜ in. thick, are fastened to the pattern, and corresponding blocks fastened to the stopping-off piece, as shown in Fig. 4. This insures the stopping-off piece being set in the proper place.

The water cylinder, shown in Fig. 5, was lengthened and its style entirely changed, as shown in the drawing, in which is indicated the new pieces that were added to the old pattern. This was a 24 by 30-in. cylinder, and eight castings, weighing over 6,500 lb. each, were made from the pattern. All the part above the new top flange was stopped off by making offsets in the port and suction-chamber cores and filling in with cores A A, Fig. 6, made for the purpose, as the plan of the mold shows. A piece as long and wide as the projecting flange was used to "strike up" a bearing for the cores.



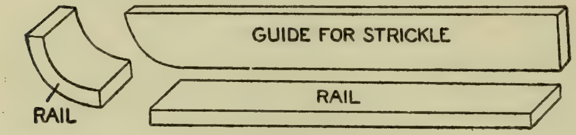


Fig. 7—An End of an Engine-Bed Pattern Which was Stopped Off in the Mold by Using Strickle Guides on Each Side and Filling in Between.

Beds for use with different combinations of cylinders are made with a cored inside, as this form is better adapted to changes. The usual plan is to make a core box long enough for the longest core and stop the shorter cores from it. A drawing is furnished the molder, as the pattern only makes a bearing for the cores, and they must be set by measurement. The end of such a bed is shown in Fig. 7. This was stopped off for a special cylinder. The stopped-off portion was approximately 2 ft. wide, 5 ft. long and 6 in. deep. This was accomplished by placing the strickle guides in the mold at each side, then filling in between and striking off the top. The guides were then drawn and the spaces left by them filled in flush. This made a "bed" in the end of the mold the exact size and shape of the part to be stopped off. On this bed the rails were placed in their proper positions against the sides and a new bed "swept up" with the rails as guides. This finished the green sand mold, bringing it up to the inside of the rails and making a bearing for the cores, which were "strickled" down to match. A piece of the proper shape was fastened in the core box to form the inside of the flange on the end of the bed, and a separate core used on the outside.

Battery Economy

To those who prefer dry batteries for all electrical work, the following method of using them on closed circuits will prove valuable. This method permits the use of dry or other open-circuit batteries on telegraph or telephone lines where the circuit must be left closed.

The ordinary methods of doing this require sufficient battery power at each end of the line to operate the system. This doubles the necessary cost of batteries, says Electrical Review.

The better method is to get just enough batteries to operate the system, place half of them at one end of the line and one-half at the other, and connect the zincs at both ends of the wire to one line, and the carbons to the other, or to the ground. The voltages of both sets will then be equal and, therefore, no current flows on the line.

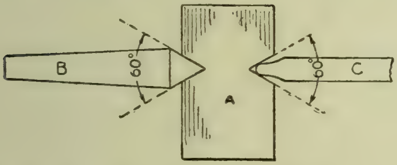
When either party wishes to call the other, he simply reverses the connections of his set of batteries and uses the instruments. By this reversal the current of both batteries flows through the line. When through talking, he restores the connections to their original condition. The direction of the current through the line depends upon which party has called the other.

The apparatus may be grouped in any way, and distributed anywhere on the line. The only condition to be observed is that the open-circuit voltages of the two sets of batteries be equal, so that no current will flow until one set is reversed. Any kind of batteries may be used together.

Gear-Cutter Gauge

The illustration shows a gauge for setting a gear cutter in a milling machine. It is made of sheet metal, about $\frac{1}{16}$ in. thick. The two edges are filed so that they will be parallel to each other, and a line is then drawn across at right angles. Cut a 60-deg. V-notch on each side, centering the line as shown.

The gauge A is set on the index head center B, and the cutter C is adjusted to the opposite V-notch. The gauge also can be used in setting the centers of the lathe.—Contributed by G. Bogen, So. Boston, Mass.



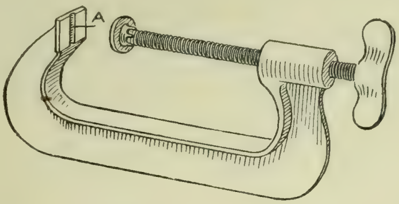
Gauge on the Center of a Lathe Setting a Cutter Exactly in the Center

Humidifier for a Cigar Case

An enterprising owner of a cigar store kept his cigar cases moist by using a device described as follows: An electric light was wrapped in sponges which were set in a dish partly filled with water. The heat of the light formed steam sufficient to keep the case moistened, with the current turned on only a few minutes each day.—Contributed by Patterson D. Merrill, Chicago.

Three-Point Bearing Clamp

An ordinary carpenter's clamp can be made to hold twice as much with half the pressure of the screw by simply grinding or filing a groove in the center of the anvil, as shown at A. This gives a three-point bearing. No matter how much the screw is tightened on an ordinary clamp, it can be turned by taking hold of the back. This cannot be done with the three-point bearing clamp.—Contributed by F. G. Marbach, Cleveland, O.

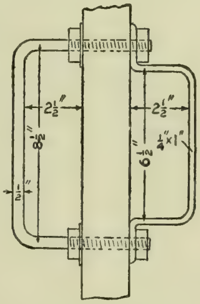


A Groove Filed in the Center of the Anvil to Increase the Holding Power of a Clamp

Handle for Heavy Doors

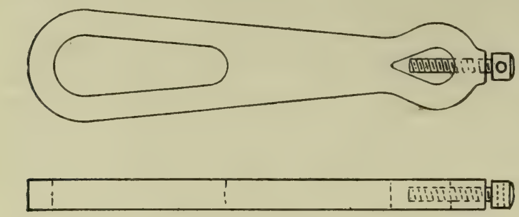
The ordinary knob is entirely inadequate for use on the heavy doors of power houses and mills, and the cast-iron handle fastened on with screws is never satisfactory. With a badly stuck door a lever or tackle block applied to pull it open is very liable to pull off or break an ordinary handle.

An unbreakable handle that gives good results is shown in the sketch. The dimensions given are those which actual use has proven satisfactory. The iron may be bent cold and should be smoothed up with a file after the bending. It will be seen that there are only few parts. The center of the handle should be 3½ ft. from the floor and is located 3 in. from the casing, when the door is closed, to give safety to the fingers.—Contributed by Van Allen Lyman, Paynes Creek, Cal.



A Hand Dog

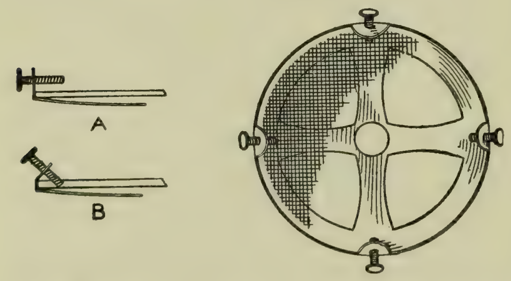
Frequently a very useful tool is also a very simple one, says American Machinist. The little hand dog shown in the illustration is an example. The uses of this tool are numerous. It may be used for holding a large variety of drills when drilling in a bench or small engine lathe. It is also very handy for holding small round stock while centering. In short, it does most of the work of a common lathe dog.


Hand Dog for Holding Small Drills When Drilling in a Small Bench Lathe

The body and screw should be hardened. An attractive appearance may be given it if, in hardening, a mottled effect is added, provided it is machine steel. The handle may be made solid or skeleton, and the screw, either as shown or in the form of a thumbscrew.

A Strainer Frame

An ordinary globe holder with the screw holders, A, bent inward as shown at B makes a good strainer frame. The object of bending the screw holders is to get them in position to press on and fasten the screen securely in the frame. The screen should fit snugly.



Frame Made of a Glass-Globe Holder for Holding Wire Screen to Strain Paint

This device will be found useful for straining paint, etc. Screens of different mesh can be used and when one becomes clogged it can be withdrawn and another inserted in its place.—Contributed by Jas. M. Kane, Doylestown, Pa.

Twin China Closets

Where a kitchen is back of the dining room a built-in closet will save the housekeeper many extra steps. The closets or cupboards are placed in the wall between the kitchen and dining room, each being a duplicate of the other from top to bottom, even to the drawers in the lower part which slide either way.

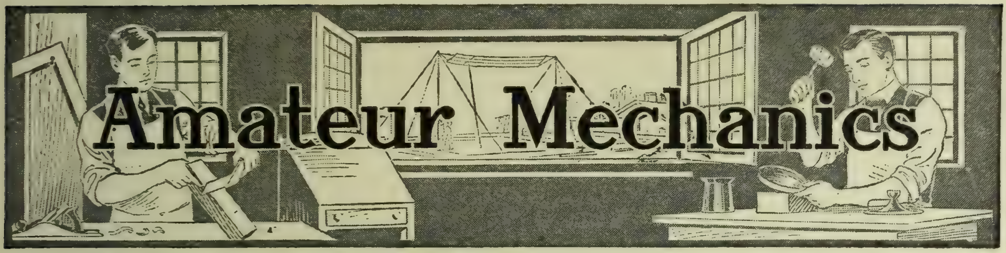
The woodwork of the closets with door catches and drawer pulls in both cases should match the woodwork and fittings of their respective rooms. The upper drawer of the cupboard for the silverware should be lined with unbleached Canton flannel. The other drawers are for the table linen.

The upper part is made with glass doors on the dining-room side, and wood doors on the kitchen side. Instead of carrying dishes back and forth they are placed on the lower shelf of the closet where they can be reached from either side. This cupboard closet thus takes the place of a serving table.

The silverware, dishes and table linen, when washed, should be put in their compartments on one side and taken out for use on the other.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Steel Pen Used in Draftsman's Ink-Bottle Cork

A steel pen makes an ideal substitute for a quill in the stopper of the draftsman's ink bottle. The advantage of this substitute is that there is always one handy to replace a broken or lost pen, while it is not so with the quill.—Contributed by George C. Madison, Boston, Mass.



Amateur Mechanics

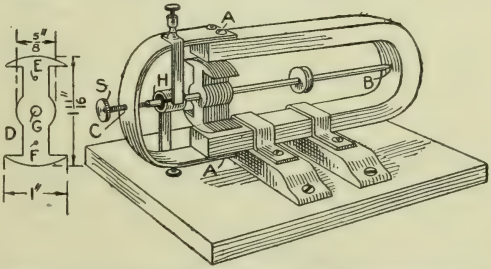
How to Build a Simple Electric Motor

By A. G. McCLURE

An exceedingly simple and inexpensive motor that may be used in operating small toys can be constructed as follows: First procure a good permanent magnet, about 5 in. long and about 1½ in. between the inside edges at the open end. This magnet should be at least ½ in. thick, and if it cannot be had in one piece, two or more may be placed side by side, like poles being placed together. The writer was unable to procure ready-made magnets, so one was formed and magnetized. Obtain a piece of tungsten or some other good-grade steel, ½ in. by ½ in., and about 11 in. long. Bend this piece into the form of a U, with the inner edges 1¾ in. apart. Square off both ends and drill two small holes in the outside surface of each end, at AA, about ⅜ in. from the end. Tap these holes for small machine screws. Drill the hole B with a small drill, about $\frac{1}{16}$ in., in the center of the lower portion of the U and ream it out. The piece should now be clamped with a good pair of blacksmith's tongs,—a block of iron being placed between the ends to keep the pressure of the tongs from drawing them together—heated to a cherry red and then plunged into a bath of oil. It can then be magnetized by placing it in contact with a permanent magnet.

Next obtain a piece of ⅛-in. brass, about ½ in. wide and 5½ in. long. Drill two holes in each end of the piece to match those drilled in the ends of the magnet, also one in the center, and tap it for a ⅛-in. machine screw. Now bend this piece into the form shown. Provide a machine screw, S, for the hole C and drill a small tapered hole in the end of the screw.

Obtain a small quantity of soft sheet iron and cut a sufficient number of pieces similar to that shown at D to make a pile ½ in. high. Cut two pieces of the same size from some thin sheet brass. Now place all of these pieces in a pile, the brass pieces being on the outside, and clamp them securely, then drill the two small holes, E and F. Place two small copper rivets in these holes and rivet the heads down before removing the clamp. Drill a ⅛-in. hole, G, through this piece, the armature, for the shaft to pass through. Procure a piece of ⅛-in. steel rod, about 6 in. long. Sharpen one end so that it will enter the hole B, then cut the other end off and sharpen it so that it will enter the opening made in the end of the screw S. The armature may now be soldered to this shaft, its left-hand surface being flush with the ends of the magnet.



Detail of Armature Laminations, and Completed Parts Assembled, but without Armature Windings

A small commutator, H, should now be made as follows: Obtain a piece of thin brass tubing about ⅝ in. in diameter. Turn down a piece of hard rubber so that the tube will fit tightly on it. Drill a hole in this piece of rubber of such a size that it will have to be forced on the steel shaft. Saw two longitudinal slots in the brass tube diametrically opposite each other and then bind these two pieces in place on the piece of rubber with some heavy linen thread wrapped around each end. The armature is now ready to wind. Get a small quantity of No. 22 gauge cotton-covered wire, solder one end to one of the segments of the commutator, then wind one end of the armature full and cross over and wind the other end full, soldering the end of the wire to the second commutator segment. Make sure to wind both ends of the armature in the same direction so the current in both parts of the winding produces magnetizing effects in the same direction. Insulate the winding from the core and the different layers from each other with a good quality of thin writing paper.

Two small brushes should now be made from some thin spring brass and mounted on the brass piece as shown. These brushes should be insulated from the piece of brass and two small binding posts should be provided for making connections to them. The position of the commutator and brushes should be such that the brushes move from one segment to the other when the ends of the armature are directly in line with the ends of the permanent magnet.

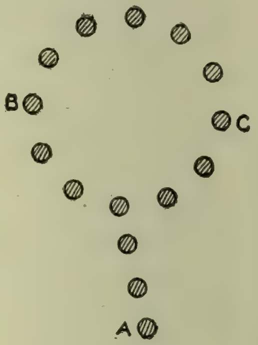
A small pulley should be mounted upon the shaft to be used in transmitting the power. The whole device may be mounted in a horizontal position on a wooden base as shown, and the motor is complete.

How to Make a Humidity Indicator

A simple weather indicator that may be used in determining the condition of the atmosphere may be made as follows: Dress a small figure, in the form of a doll, with a piece of cloth, previously dipped in the following solution: Chloride of cobalt, 30 parts by weight; sodium chloride, 15 parts; gum arabic, 7½ parts; calcium chloride, 4½ parts, and water, 400 parts. This cloth will change color as the amount of moisture in the atmosphere changes, the change being due to the cobalt salt, which, in dry air, is lavender blue. As the moisture in the atmosphere increases, the color changes first to bluish red, then light red and finally pink, according to the amount of moisture. With a decrease in moisture, the colors change in the reverse order to that given above, and the blue color returns when the air becomes dry.

The "Q" Trick

Lay out the form of the capital letter Q with coins on a table and ask someone in the audience to select a number and then ask that person to count up from one until the number is reached, beginning at A and stopping on the circle, for instance at B, then counting back again beginning with one, but, instead of counting on the tail, pass it and go around the circle, say, to C. The performer gives these instructions to the person doing the counting. The one selecting the number must not tell the performer what the number is, and the latter is to leave the room while the counting proceeds. The performer, before leaving the room, is to tell which coin will be the last one counted.



Take, for example, the number 7. Counting from A to B there are just 7 coins and counting back the last number or 7 will be at C. Try 9 for the number and the last one counted will also be C. The number of coins in the tail represents the number of coins in the circle from the intersection of the tail and circle to the last number counted. For instance, the sketch shows 4 coins in the tail, therefore the last coin counted in the circle will be at C or the fourth coin from the intersection of the tail and circle.

By slipping another coin in the tail the location of the last coin counted is changed, thereby eliminating any chance of exposing the trick by locating the same coin in the circle every time. This can be done secretly without being noticed.

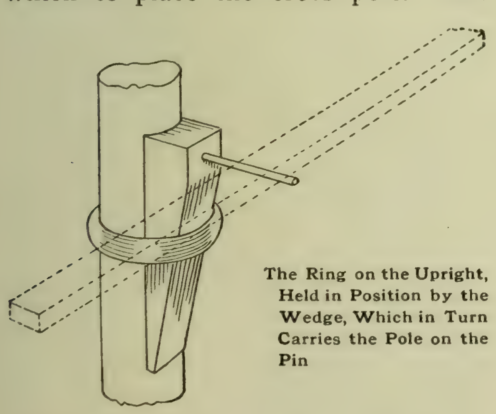
To Keep Ants Away From Food

Suspend a shelf, breadbox or rack with wire around which is tied a piece of cotton cloth, saturated with a mineral oil. The ants will not cross the oil-soaked cloth.

Some strong wire hooks attached to the rack or shelf answer well to hang small articles on, such as bacon, bags of sugar, syrup cans, etc.—Contributed by C. B. Hosford, Swansea, Ariz.

Vaulting-Pole Holder

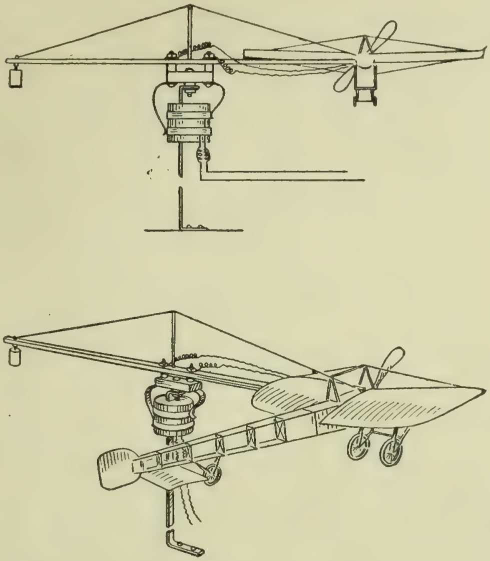
An adjusting device for a vaulting pole that can be easily fixed at any point on a round pole by using a wedge and ring, is shown in the sketch. The wedge carries a pin on which to place the cross pole. The manner of using this device as well as its construction is clearly indicated.—Contributed by Sterling R. Speirs, St. Louis, Mo.



The Ring on the Upright, Held in Position by the Wedge, Which in Turn Carries the Pole on the Pin

Flying Model Aeroplane for a Display

A novelty for a window display is made of a model aeroplane flying by its own power. To control the direction and make the model fly in a circle it is fastened to a long stick or beam which is pivoted in the center. The one shown was pivoted to a roller-skate wheel which in turn was fastened to a metal standard. The beam was attached to the skate wheel with two small bolts which were insulated and carried two brushes as commutator contacts.



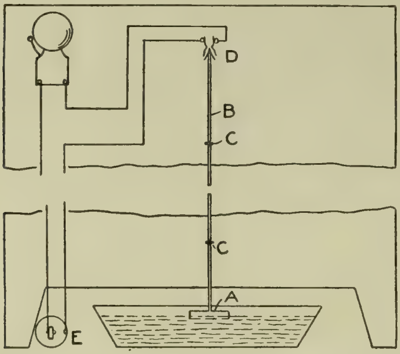
Detail of Parts Showing Wire Connections and Model in Flight around the Central Axis

The commutator rings were made of heavy brass strips, fastened to a round piece of wood which was attached to the metal standard. The wires from the current supply were connected to the commutator rings. From the brushes connecting wires were carried along the beam to the aeroplane motor which was a small battery motor with propeller.

The opposite end of the beam was weighted to balance it. The first sketch shows the parts and the manner of making the connections. The aeroplane is driven in a circular path by its own power in a realistic manner.

Drip-Pan Alarm

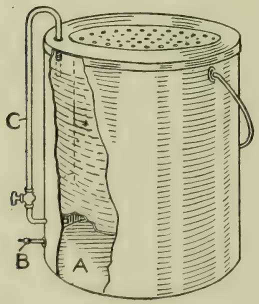
The trouble caused by overflowing of the drip pan for an ice box or refrigerator can be overcome by attaching a device that will sound an alarm when the water reaches a level safely below the overflow point. A device of this kind may be attached to the back of the refrigerator as shown in the sketch. A float, A, is attached to the lower end of a rod, B, which slides through staples CC. At the upper end of the rod, a V-shaped copper sheet, D, is soldered. This makes the contact points in the electric wiring. The battery E can be placed under or back of the refrigerator as desired. The method of wiring is clearly shown.



The Float in the Pan, and Contacts for Closing the Circuit to Ring the Bell

A Live-Bait Pail

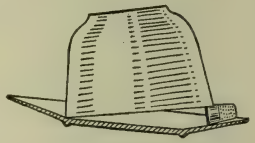
Every fisherman knows that live bait will soon die if they do not receive sufficient air. I have succeeded in keeping bait alive and healthy by using a pail of my own construction, which is provided with a compressed-air space to force air to the surface of the water. The air space A takes up one-fifth of the interior at the bottom of the pail, and an ordinary hand bicycle pump is used to fill it through a bicycle-tire valve, B. The pipe C from the air space extends up along the side of the pail and the upper end is bent so that it just touches the surface of the water. The pipe contains a valve to regulate the flow of air.



After the pail has been standing for an hour or more, the bait will rise to the top. The valve is then opened for a few minutes, and the minnows will soon swim around in the water as when this was fresh.—Contributed by T. Whelan, Paterson, N. J.

A Mouse Trap

After using various means to catch the mice in my pantry, I finally decided I could not catch them in the ordinary manner. Knowing that mice are not afraid of dishes but will run all over them, while they will stay away from other things, I took a dinner plate, a bowl that held about 1 qt., a thimble, filled with toasted cheese, and arranged the articles as shown in the sketch, balancing the bowl on the thimble. When the mouse nibbled the cheese, the bowl came down on it, making it a prisoner. The whole was then dropped in a pail of water. Scald the dish and bowl before using them again to remove all traces of the mouse.



Quickly Made Rheostat

A short time ago I found it necessary to melt some silver, and in setting up an arc light to obtain the heat I made a rheostat by winding wire around a large earthenware jar. As the jar is a non-conductor and would not burn, it served the purpose perfectly. In winding the wire, be careful to keep the coils from touching each other.—Contributed by P. D. Merrill, Chicago, Ill.

Leaded-Glass Panels for Furniture

Certain kinds of furniture may be greatly improved in appearance by the use of simple glazed panels in the door frames. It would be inappropriate to have anything elaborate in a small cabinet for the reception of china as it distracts the attention from the contents, but a simple leaded diapering or pattern of small design, such as shown in Figs. 1 and 2, would be quite in place and have a good effect. For other purposes more elaborate effects can be worked out in deep shades, says Work, London.

A hanging cabinet with leaded panels is shown in Fig. 3. These panels for the doors are in the design shown in Fig. 2. Panels of this design can be used either for furniture or for small windows. The process of making these panels is not difficult and the ordinary workman can form them, the only difficult part being the soldering of the joints.

The beginner should confine himself to plain glazing, the design being formed by piecing together glass of different shades. The method of procedure is to first make a small sketch in color to a scale of about 1 in. to the foot, carefully arranging the parts and colors. A full-sized panel can be drawn from this sketch. The effect of plain glazing depends entirely on the arrangement of the lead lines and the art glass. In the full-sized drawing the shapes are arranged so that they may be easily cut, all long forms being either avoided in the design, or divided by a cross-lead to guard against breakage in the cutting.

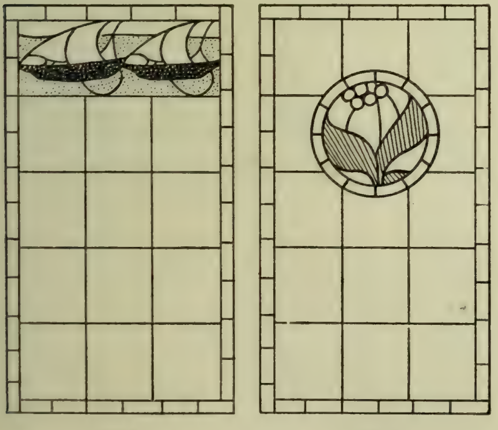


Fig. 1 Fig. 2

Simple Leaded Diapering of Small Design for a Small China Closet or Cabinet

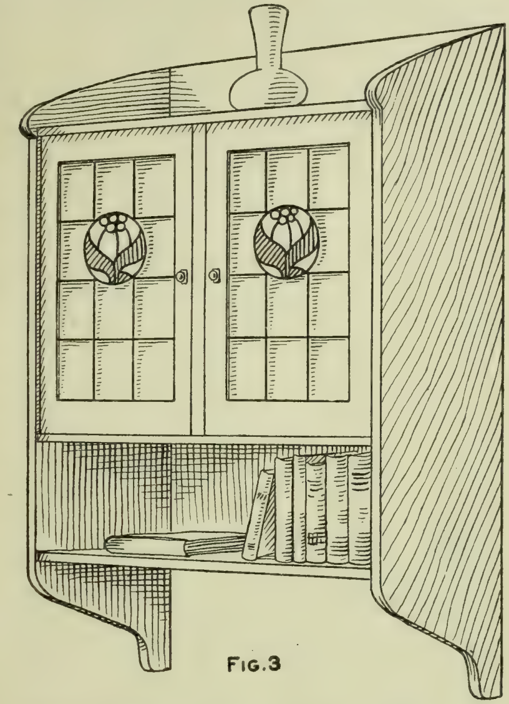


Fig. 3

A Small Hanging Cabinet with Doors Having the Leaded-Glass Design Shown in Fig. 2

Two simple forms of glazing are shown in Figs. 1 and 2. The one shown in Fig 4 is somewhat different, the top of the panel being decorated with simple curves. This general design is considerably elaborated in Figs. 5, 6 and 7. It is desirable to decorate only a part of a window so that the maximum of light may gain access.

Two simple treatments of a sailing craft are shown in Figs. 8 and 9. The effect of the introduction of this design in one of the panels of a small cabinet is shown in Fig. 1.

An example of plain glazing is shown in Fig. 10. This is a piece of simple leading and yet very effective, involving no difficulty of construction.

For this lead glazing a quantity of strip lead, the section of which is shown in Fig. 11, will be required. This can be purchased from dealers in art-glass supplies. The lead is sold on spools and it must be straightened before it can be worked. This is most easily done by fastening one end and pulling on the other. The glass for this work must be reasonably thin as no advantage is gained by the use of thick material, and it is difficult to cut. A piece of art glass has a right and a wrong side, the side on which the spots and streaks appear is the right side, and it is cut on this side. The tools required are a glass cutter, a heavy knife and soldering appliances.

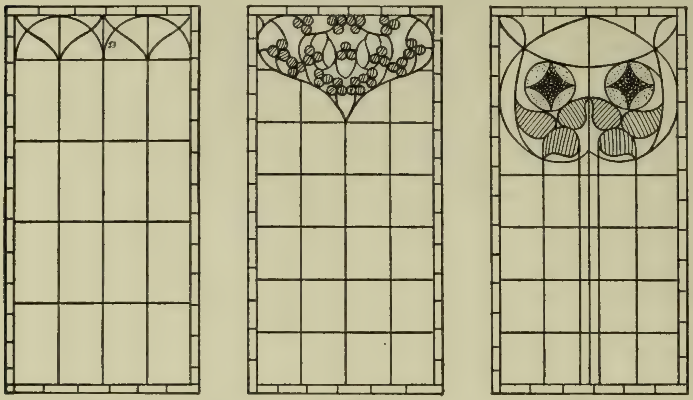


Fig. 4 Fig. 5 Fig. 6

Only a Part of the Top of Each Window is Highly Decorated so That the Maximum Light may Gain Access

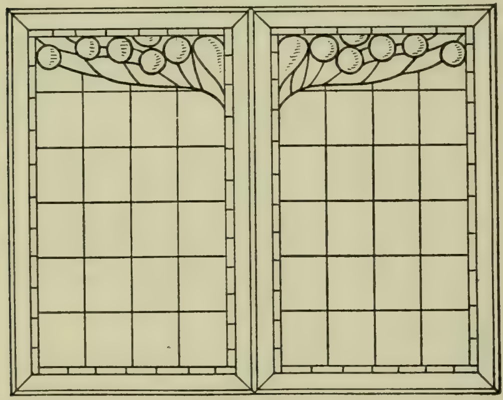


Fig. 7

Two Windows Placed Together May Have Their Tops Leaded to Produce a Combined Effect

Sketch out the lines of the design full size on paper, drawing in only one side of a symmetrical pattern and tracing the other. After the design has been prepared, the next step is to make a cutting pattern. To do this, take a piece of tracing cloth and lay it on the drawing. Trace the lines and go over them with a brush dipped in black, making the lines exactly the same thickness as the core of the lead, or the thickness of the distance the glasses are separated from one another, as shown in Fig. 11. Each division is marked for the color it is to be and the paper is then cut into sections on each side of the broad line. These pieces form the patterns for cutting similar shapes from heavy cardboard which serve as templates for cutting the glass.

Proceed to cut the glass by laying a pattern on the right side and scoring around with the cutter guided by the pattern. Little difficulty will be experienced in this work if the general design does not have very irregular shapes.

When the various pieces of glass

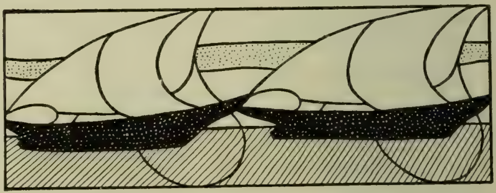


Fig. 8

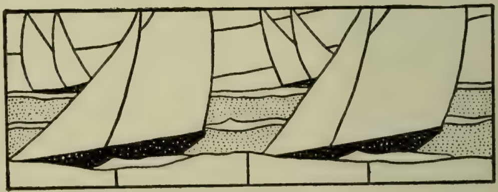


Fig. 9

Two Designs for the Tops of Windows, Showing Treatments of Sailing Craft have been successfully cut and are ready for leading up, arrange them in position on the preliminary sketch, and then measure the outside leads and cut one piece for each side, the lead being cut to fit against the core of the other at the joint, as shown in Figs. 12 and 13. Proceed to cut the lead for the long curves, obtaining the length by bending the strips along the lines of the design. As each is cut it will be found convenient to tack it in position on the working table by means of small brads, so as to simplify the measuring and cutting of the other parts. Continue until the panel is complete, when, after truing up, it is ready for soldering. This is done in the usual way but requires extraordinary care to avoid the possibility of melting the lead. The overlapping parts of the leads are pressed well against the glass in each division to keep it from rattling.

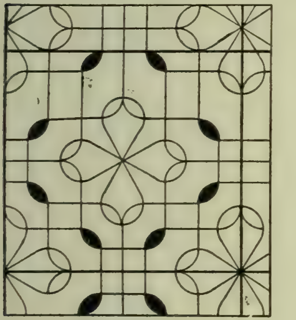


Fig. 10

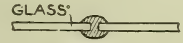


Fig. 11

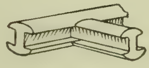


Fig. 12

Example of Plain Glazing with Cross Section of Glass and Lead Strip, also Showing Joint

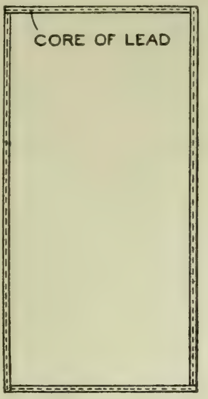


Fig. 13

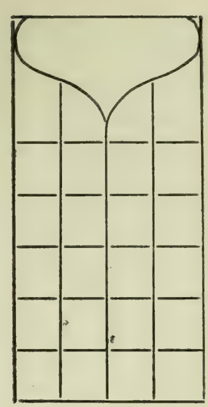


Fig. 14

The Lead Frame is First Made, the Long Lines are Put in and Then the Short, Horizontal Ones

In making up the squares and rectangles such as appear in Figs. 2, 4, 5, 6 and 7, lead the long lines first, adding the shorter, horizontal pieces last. The sketch, Fig. 14, will clearly illustrate this part of the work. The sketch shows the starting of the panel, Fig. 5.

Raising Cucumbers on a Trellis

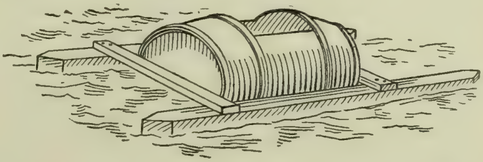
A novelty in cucumber culture, tried recently with great success, is as follows: As soon as the vines are about 18 in. long, stretch wire mesh 24 in. wide on poles alongside the row of plants and train the vines on the wire. The cucumbers will grow larger and the plants will require less care than when they are on the ground.

A Barrel Boat

A boat that any handy boy can easily make is constructed of a barrel which is kept with the opening cut in one side up by two 4 by 6-in. timbers and two tie pieces, 2 by 4 in. The lengths of these pieces will depend on the size of the barrel.

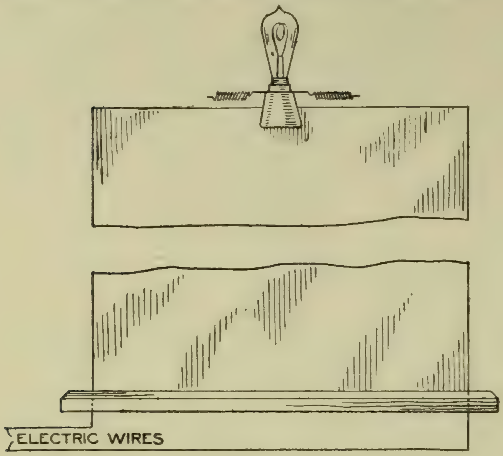
A good watertight barrel should be selected and an opening cut in the center between the hoops, of such a size as to allow the body of the occupant room for handling an oar. The timbers are attached to the barrel with iron straps—pieces of old hoops will do. The two tie pieces are put across the timbers at the ends of the barrel and spiked in place.

The boat is to be propelled with a single, double-end paddle. There is no danger of the boat capsizing or the water splashing into the barrel.


Boat Made of a Barrel Which is Kept from Capsizing by Timbers Attached

Electric-Light Mystery

A novel attraction for a window display can be made of a piece of plate glass neatly mounted on a wood base, and an electric light which is placed on the top edge and may be lighted apparently without any wire connections.

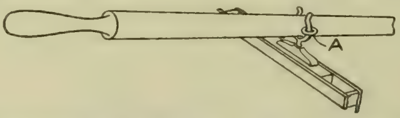


Electric Light Mounted on Top of a Plate Glass with Hidden Connections on the Glass Edge

The method of concealing the connections is to paint the edges of the glass green, then, before the paint is quite dry, lay on a thin strip of copper, making the connections at the base on both sides, and to the lamp in the same manner. Another coat of paint is applied to cover the strip. The color should be an imitation of the greenish tint of glass edges. Any desired lettering can be put on the glass. —Contributed by O. Simonson, Brooklyn, N. Y.

An Oar Holder

Persons rowing boats, particularly beginners, find that the oars will slip out of the oarlocks, turn or fall into the water. This may be avoided by turning a screweye of sufficient size to prevent binding on the lock into the oar and placing it over the lock as shown at A, so that the pull will be against the metal. The oars will never slip or jump out, will always be in the right position, and it is not necessary to pull them into the boat to prevent loss when not rowing. The locks will not wear the oars, as the pull is on the metal eye. Place the eye so it will have a horizontal position on the side of the oar when the blade is in its right position.



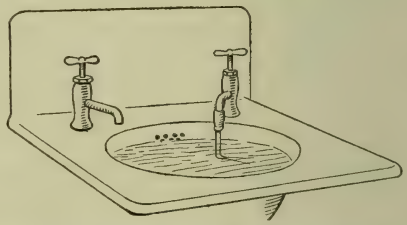
The Screweye in Position on the Oar and over One Prong of the Oarlock

Cooking Food in Paper

A flat piece of paper is much more convenient to use than a paper sack in cooking, as it can be better fitted to the size of the article to be cooked. Wrap the article as a grocer wraps sugar, folding and refolding the two edges together until the package is of the proper size, then fasten with clips and proceed to close the ends in the same way. This avoids all pasted seams and makes the package airtight. —Contributed by J. J. A. Parker, Metamora, O.

Washing Photograph Prints

Photographic prints may be washed in a stationary washbowl with just as good results as if washed in a high-priced wash box, by cutting off the upper end of the rubber nipple on a bent glass medicine dropper and placing it on the faucet as shown in the illustration. This arrangement causes the water to whirl around in the bowl, which keeps the prints in constant motion, thus insuring a thorough washing.—Contributed by L. O. D. Sturgess, Arlington, Oregon.

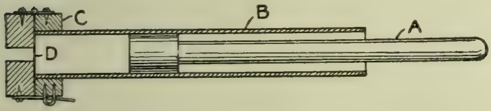


A Medicine Dropper on a Faucet Produces a Whirling Motion of the Water in the Bowl

A Toy Popgun

A toy popgun can be easily made of two blocks of hard wood, ½ in. thick; a joint of bamboo, about ⅞ in. in diameter and 6 in. long; a small hinge, a piece of spring steel, ½ in. wide and 1 in. long, and a piece of soft wood for the plunger.

The plunger A is cut to fit snugly, yet so it will move easily in the piece of bamboo B. One of the blocks of hard wood, C, is bored to fit one end of the bamboo, the other block has a ¼-in. hole bored, to center the hole in the first block. The two blocks are hinged and the spring latch attached as shown in the sketch. The spring has a hole drilled so it can be fastened with a screw to the outer block, and a slot cut in the other end to slip over a staple driven into the block C.

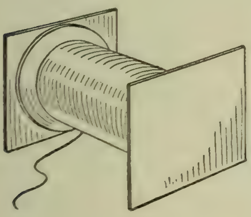


Detail of Popgun, Showing the Parts Assembled and Position of the Paper

A piece of paper, D, is placed in between the blocks while the plunger A is out at the end of the bamboo. A quick pressure on the plunger A will cause the paper D to break out through the small opening with a loud pop.—Contributed by Paul H. Burkhart, Blue Island, Ill.

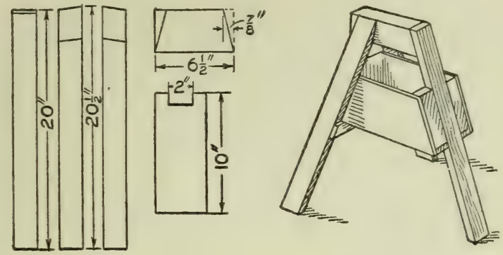
A Non-Rolling Thread Spool

A spool of thread may be kept from rolling by gluing squares of cardboard to the ends. The squares should be a little larger than the spool. This will save many a step and much bending over to pick up the spool. The spool, when it falls, will stop where it landed.—Contributed by Katharine D. Morse, Syracuse, N. Y.



Shoe-Shining Stand

To anyone who finds it tiresome to shine his shoes while putting the foot on the rim of a bathtub, on a cookstove or chair with a newspaper on it, the stand here described will afford relief and at the same time he will always have the shining outfit ready for use.

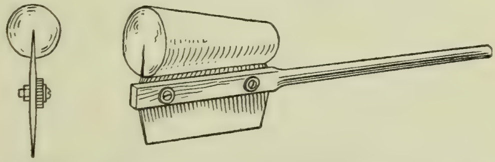


Dimensioned Parts and Completed Stand Which has a Box to Hold the Shining Outfit

The whole is of pine, the foot rest being made of a piece 2 by 4 in.; the legs, of 1 by 2 in., and the bottom of the box, of ½ by 4¼ in. All other dimensions are given in the sketch. After the legs are attached and the bottom of the box in place, the sides are fitted and fastened with nails.—Contributed by Samuel Hughs, Berkeley, Cal.

Cutter Made of a Wafer Razor Blade

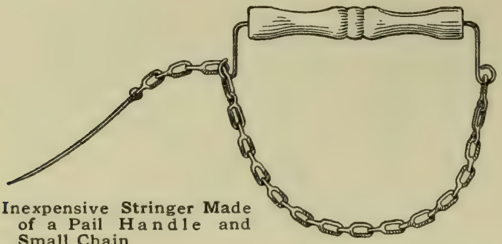
A useful instrument for seamstresses and makers of paper patterns and stencils can be made of a piece of steel or iron and a wafer razor blade. The end of the metal is flattened and two holes drilled to match the holes of the razor blade. Small screw bolts are used to attach the blade to the handle. Place a cork on one edge as a protection for the hand of the user.—Contributed by Maurice Baudier, New Orleans, La.



The Wafer Blade Attached to the Handle, the Top Edge being Protected with a Cork

A Fish Stringer

The illustration shows a very simple and inexpensive device for the angler to string and carry fish. It is made of a pail handle through which is passed a piece of soft wire, having sufficient length for bends or loops at each end, and a piece of chain. A chain 18 in. long is sufficient. One end of the chain is fastened in the loop at one end of the handle, and the other has a piece of wire attached for pushing through the gills of the fish. The other end of the wire through the handle is arranged in a hook to catch into the links of the chain.—Contributed by G. O. Reed, Stratford, Canada.

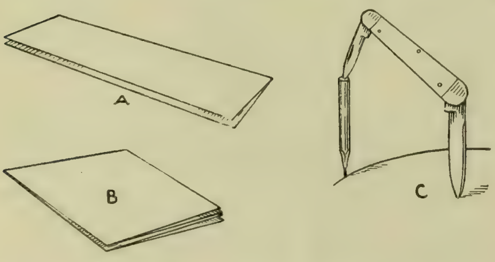


Inexpensive Stringer Made of a Pail Handle and Small Chain

Substitutes for Drawing Instruments

Three of the most used draftsman's instruments are the compass, ruler and square or triangle. When it is necessary to make a rough drawing and no instruments are at hand, common and easily obtainable things can be used as substitutes.

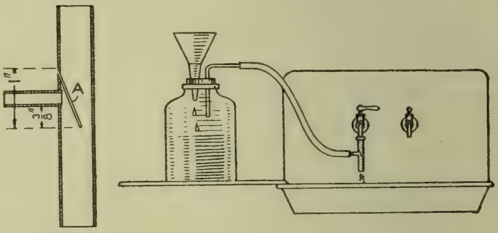
A sheet of heavy paper folded as shown at A will serve as a ruler, and the same sheet given another fold will make the square B. If given another fold diagonally, a 45-deg. triangle is formed. A substitute compass is readily made of a short pencil and a pocket knife, as shown at C.—Contributed by Jas. J. Joyce, Olongopo, Philippine Islands.



A Compass, Ruler and Square Made of Ordinary Things at Hand

How to Make an Aspirator

A simple aspirator that may be used for a number of different purposes, such as accelerating the process of filtering, emptying water from tubs, producing a partial vacuum in vessels in which coils are being boiled in paraffin, etc., may be constructed as follows: Obtain two pieces of brass tubing of the following dimensions: one 7 in. long and ¾ in. outside diameter, and the other, 3 in. long and ¼ in. outside diameter. Drill a hole in one side of the large tube, about 3 in. from one end, of such a diameter that the small brass tube will fit it very tightly. Take an ordinary hacksaw and cut a slot in the side of the large piece, as shown at A. This slot is sawed diagonally across the tube and extends from one side to the center. Obtain a piece of sheet brass that will fit into this slot tightly, and then solder it and the small tube into the large tube. The slot and hole for the small tube should be so located with respect to each other that the small tube will empty into the larger one directly against the piece of sheet brass soldered in the slot.

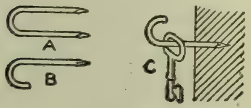


Detail of the Aspirator and Its Connections to a Faucet, for Increasing the Speed of Filtration

The upper end of the large tube should be threaded inside to fit over the threads on the faucet, or an attachment soldered to it similar to those on the end of an ordinary garden hose. A rubber hose should be attached to the small tube and connected, as shown, to a piece of glass tubing that is sealed in the cork in the top of the large bottle. The funnel holding the filter paper is also sealed into the cork. Melted paraffin may be used in sealing the glass tube, funnel and cork in place, the object being to make them airtight. The filter paper should be folded so that it sticks tightly against the sides of the funnel when the liquid is poured in, thus preventing any air from entering the bottle between the paper and the funnel. Turn on the faucet, and it will be found that the time required to filter any liquid will be greatly reduced. Be careful, however, not to turn on too much water, as the suction may then be too strong and the filter paper become punctured.

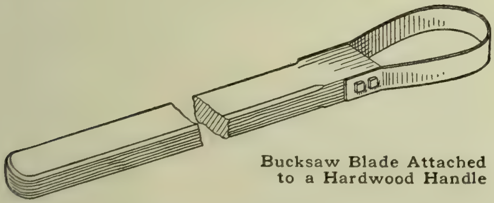
A Key-Holder Hook

A good hook for hanging keys, toothbrushes and other small articles can be made from ordinary wire staples, as shown at A. One leg of the staple is cut away as shown at B and the other leg driven into the board as shown at C. These will answer the purpose as well as screw-hooks.—Contributed by W. C. Heidt, Chicago.



A Hand Hoe

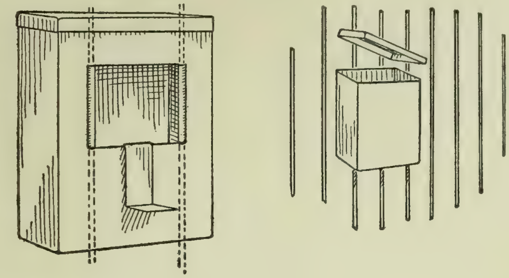
A hand hoe, especially adapted for weeding or cultivating small truck, particularly onions, can be made of a piece of hard wood, ⅞ by 1¾ in. by 4 ft. long, and a piece of old bucksaw blade. A blade, 18 in. long and 2 in. wide, bent into a loop is attached with bolts to the handle.—Contributed by Geo. H. Miller, Iowa City, Iowa.



Bucksaw Blade Attached to a Hardwood Handle

Seed Receptacle for Bird-Cages

A handy seed and water container for a bird-cage can be made of a common spice tin. The receptacle can be filled without removal by simply taking off the cover. Thus the seed will not be scattered.

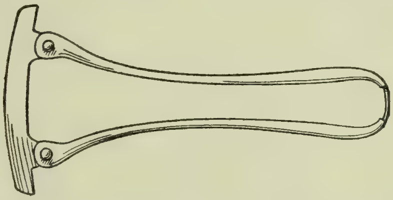


Spice Tin Attached to the Wires of a Bird-Cage for a Water or Seed Receptacle

The tin is attached by cutting a hole in the back as shown, and bending the side edges to fit over the wires to hold it in place. The bottom strip is a support which rests on the floor of the cage and prevents the tin from slipping down on the wires.

Kitchen-Utensil Scraper

A flexible utensil scraper is one of the most useful articles I have in my kitchen. It covers such a large surface in scraping pans, kettles, etc., that this most disagreeable part of the kitchen work is quickly and easily accomplished.



The Blade is Flexible so It can Readily Shape Itself to the Curves of a Kettle

The flexible blade is attached to the tin handles with small rivets. The blade should be thin and narrow enough to allow it to bend. When the handles are pressed together, the blade curves to the shape of the utensil's surface.—Contributed by Mrs. Della Schempp, Brodhead, Wis.

INTERESTING PATENTS,

LEG-PULLING APPARATUS—An apparatus for pulling or stretching the lower limbs of a person, a treatment used in certain hip diseases, etc., is shown in Fig. 1. A vertical post, carrying pulleys, is attached to the foot of the bed, and a cord, bearing weights on one end, is run over the pulleys and attached to the ankle of the subject. The weights, which are similar to those of a weighing scale, may be increased or decreased in number as the treatment requires.

ARM-OPERATED SHOE CLEANER (British patent)—Figure 2 shows a shoe-cleaning and polishing apparatus comprising a stand on which to place the foot, and a band of cloth with a wooden arm attached to each end. The cleaning or polishing cloth is worked over the shoe by means of the wooden arms, the purpose of which is to do away with the necessity of stooping down to reach the shoe. Some kind of a pulley arrangement that would allow the strip of cloth to be worked over the shoe by pulling and pushing the arms or levers, instead of working them loosely up and down, would seem to be a practical improvement.

SLIVER-REMOVING TWEEZERS (British patent)—A pair of tweezers, especially designed for the extraction of splinters, hair, etc., from the flesh, is shown in Fig. 3. The tweezers are provided with means for pressing on the flesh surrounding the splinter, thereby preventing the flesh from being pulled up with it, and also assuring, by pushing the flesh down from the splinter, a firm hold upon the latter. In the form of tweezers shown in operation, the pressure of the palm on the spring head holds down the flesh as the tweezer arms are raised upward in withdrawing the splinter. In the modification shown at the right, the points of one arm are adapted to grip the splinter and slide up the inclined arm when pressure is exerted, while the modification shown on the left is a form similar to the first, but having the spring connected to one of the pressing legs.

COMBINED SICKLE, CORN KNIFE AND PRUNING SAW—Figure 4 shows a combination tool which may be used for pruning small trees and shrubs, for cutting the grass of lawn borders, and as a corn knife. The handle is adjustable to the positions shown in the drawing.

HOOF SUPPORT FOR HORSESHOEING—A support adapted to hold either of the hind hoofs of a horse in raised position for shoeing is illustrated by Fig. 5. The apparatus comprises a saddle; a lever; a collar, to engage with one end of the lever, and a foot-supporting attachment fastened to the other end of the lever.

LOCK FOR WEARING APPAREL—Devices of several kinds for locking umbrellas to hooks or umbrella stands in restaurants and like places, have made their appearance from time to time. Figure 6, however, shows a device for not only safeguarding the umbrella, but the outer coat and the hat as well. It comprises a rod adapted to pass through eyes or other openings in the articles to be locked, and a lock designed to cap one end, after the articles have been placed on the rod. The rod is attached to one end of a chain and the cap to the other.

BEDCLOTHES FASTENER (British patent)—Any person who has experienced the disagreeable sensation which results from pulling or kicking the bedclothes from under the mattress at the foot of the bed on a cold night, will appreciate the endeavor of the British inventor of the device shown in Fig. 7, to prevent such an experience. It consists of two strips of wood or other suitable material adapted to be bolted together to clamp the bedclothes at the foot.

GOLF-STROKE TEACHING APPARATUS (British patent)—An apparatus for teaching the correct swing with a golf club is shown in Fig. 8. It comprises an arm pivoting on a spindle and attached by straps to the shoulders of the player's body. It constrains the player's body to move, when making a stroke, about an imaginary line passing from a point near the crown of his head and emerging near the base of his spine. Both the height of the rod and the inclination of the spindle may be adjusted. A wall bracket may be used instead of the column to support the apparatus.

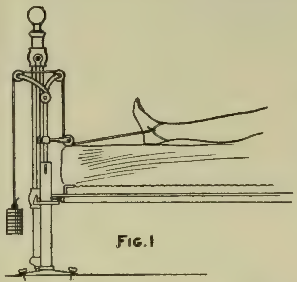


FIG. 1

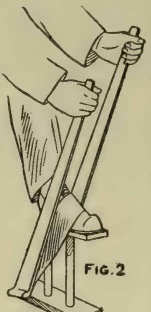


FIG. 2

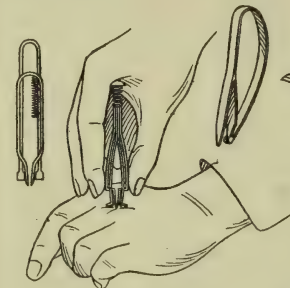


FIG. 3

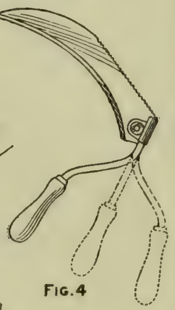


FIG. 4

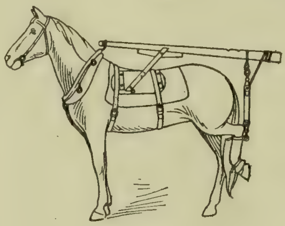


FIG. 5

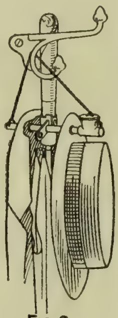


FIG. 6

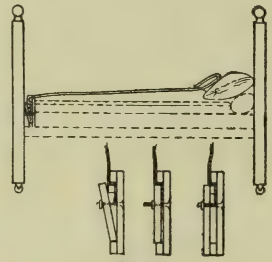


FIG. 7

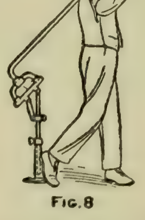


FIG. 8

FIG. 9

PRACTICAL OR UNIQUE

ROLLER POLE FOR ROLLER SKATERS—When the very small boy who likes to play horse astraddle a broomstick becomes old enough to use roller skates, he may carry out the idea in a more practical way with a roller pole of the kind shown in Fig. 9. The device comprises a pole provided with a roller at one end, a seat near the center, a crosspiece for the hands at the other end, and a second crosspiece between the first mentioned crosspiece and the seat. This second crosspiece is to brace his knees against when he sits down on the seat after getting a good start.

MAGNIFYING GLASS FOR NEEDLE-THREADING (British patent)—The device shown in Fig. 10 is designed as an aid to the eyesight when it is necessary to thread a needle. It is a small magnifying glass which may be attached to the thumb by means of a spring clip, in the position shown.

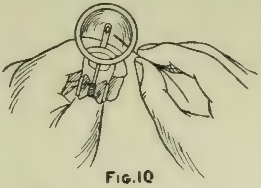


FIG.10

RUBBER-PROTECTED NURSING BOTTLE—(British patent)—A boat-shaped nursing bottle protected by two large rubber rings projecting beyond the body of the bottle is illustrated in Fig. 11. The rings may be solid or hollow and are connected together by a sheath.

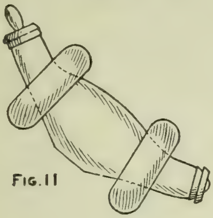


FIG.11

BOTTLE-RINSING FAUCET—Figure 12 illustrates a special cock arrangement for kitchen-sink faucets, the purpose of which is clearly shown. The bottle to be rinsed is slipped over the fixture and rests on a collar, in the sides of which portions are cut away to provide an escape for the water from the bottle.

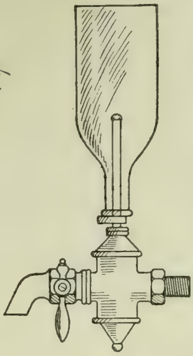


FIG.12

PARACHUTE FIRE ESCAPE—Figure 13 is a curious parachute arrangement by means of which a person, shut off by fire or smoke from other ways of escape, is expected to drop to the sidewalk or ground in safety. The parachute apparatus is designed to be attached in operative position outside a window, the parachute being contained in a tubular protector. The person attempting to escape works himself to the outer edge of the window sill, places his arms through arm supports and slides off, the parachute opening to retard and brake the descent, so that the ground will be reached without any harmful shock.

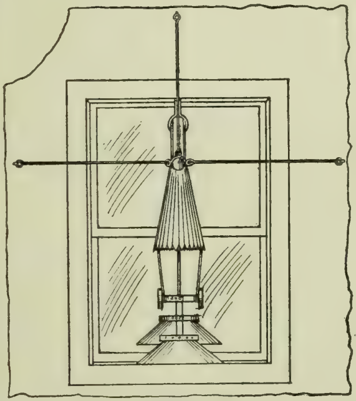


FIG.13

DIVISIONAL TOOTHBRUSH—Figure 14 illustrates a toothbrush having its bristles arranged in different-sized tufts, so shaped as to reach every part of the surfaces of the teeth.

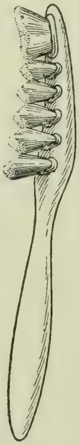


FIG.14

COAT-AND-SKIRT HANGER (British patent)—Coat hangers of many kinds and varieties have made their appearance on the market, but this hanger (Fig. 15) is a little different from others in that it is designed especially for women's wearing apparel and accommodates both the coat and skirt of a suit. The hanger comprises two hinged members, each of which is formed with two arms of different curvatures, the upper arms supporting the coat, and the lowers arms, the skirt. The hanger may be folded about the hinge, which is just under the hook, and is prevented by stops from collapsing while in use.

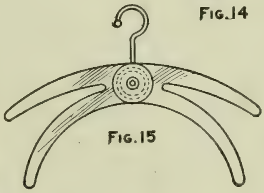


FIG.15

ROLLER FLOUR CONTAINER—Figure 16 shows a rolling-pin flour container, the hollow body of which is perforated to allow a discharge of flour onto the surface over which the pin is rolled. One of the roller handles is also hollow, and in it is contained a dough knife.

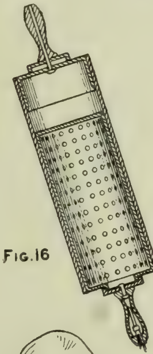


FIG.16

SWIMMING MITT—A swimming mitt, having a body of a length and width to slip fairly closely over the four fingers of the hand, is shown in Fig. 17. The purpose of the mitt is to make possible a more effective stroke in swimming by preventing any flow of water between the fingers.

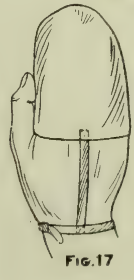


FIG.17

SHOE WITH COMBINATION ELASTIC AND LACED UPPER—A laced-upper shoe which may be drawn onto and removed from the foot without unlacing is shown in Fig. 18. The back portion of the upper is of elastic material, and around this passes a leather strap provided with a snap button, the purpose of the strap being to hold the upper snugly around the ankle. The strap may be unsnapped to ease the tightness of the shoe when the wearer is reclining in an easy-chair.

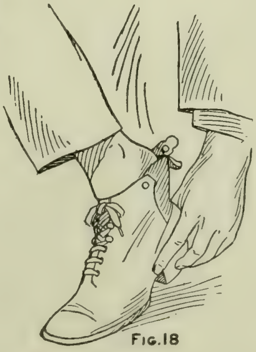


FIG.18

FOR the purpose of advertising fishing rods, a shopkeeper hung a large rod outside his shop, with an artificial fish at the end of it. Late one night Perkins, who had been dining a bit too well, happened to see the fish. Going cautiously to the door, he knocked gently.

"Who's there?" demanded the shopkeeper from an upper window.

"Sh-h! Don't make a noise, but come down as quietly as you can," whispered Perkins. Thinking something serious was the matter, the man dressed and stole downstairs.

"Now, what is it?" he inquired.

"Hist!" admonished Perkins. "Pull in your line, quick; you've got a bite."

◆ ◆ ◆

"Mighty mean man I's wukin' fer."

"What's de mattah?"

"Took de laigs off de w'eelbarruh so's I kain't set it down an' rest."

◆ ◆ ◆

Recently in Seattle in a cigar-stand appeared the sign, "We give $15.00 for 1909 Lincoln pennies." No less a person was attracted by this than Judge Watson. He walked up to the counter and laying down a penny triumphantly asked for $15.00. The clerk took the penny, examined it closely, asked if it were genuine, and after several minutes sighed and said he guessed it was good.

"Certainly it is," answered the Judge. "Where is my $15.00."

"Where," said the clerk, "are the other 1908?"—Life.

◆ ◆ ◆

He had dropped a nickel in the slot of a telephone pay station and stood patiently waiting. He was full to the brim. He read the instructions and took down the receiver.

"Number?" asked central.

"Fife centsch."

"What do you want?"

"Spearmint."

◆ ◆ ◆

A Harvard professor, noted for his severe way of examining students, tackled a raw-looking freshman: "I understand you attend the class for mathematics?" "Yes." "How many sides has a circle?" "Two," said the student. "Indeed! What are they?" "An inside and outside!" was the prompt reply. "And you attend the moral philosophy class also?" "Yes." "Well, no doubt you heard lectures on various subjects. Did you ever hear one on cause and effect?" "Yes." "Does an effect ever go before a cause?" "Yes." "Give an instance!" "A barrow wheeled by a man!" The doctor hastily sat down and put no more questions.

◆ ◆ ◆

A Texan and a New Yorker were one day discussing the relative merits of their respective climates.

"Down where I live," said the Texan, "we grew a pumpkin so big that when we cut it my wife used one-half of it as a cradle to rock the baby in."

The New Yorker smiled. "Why, my dear fellow," he said, "that's nothing at all. A few days ago, right in New York City, three full-grown policemen were found asleep on one beat."

A new book of memoirs in England recalls what has been styled the most brilliant epigram ever written. It was written by one J. K. Stephen, Cambridge undergraduate, about a stout professor, Oscar Browning:

KINDLY WARNING TO A FAT MAN.
O. B., oh, be obedient
To Nature's stern decrees;
For, tho you be but one O. B.,
You may be too obese!

◆ ◆ ◆

"Bill's goin' to sue the company fer damages."

"Why? wot did they do to 'im?"

"They blew the quittin' whistle whin 'e was caryin' a 'eavy piece of iron and 'e dropped it on 'is foot."—Domestic Engineering.

◆ ◆ ◆

He had been to Europe and returned, and he was telling a friend on the car what he had seen, when a man with red eyebrows leaned across the rail and said:

"I beg your pardon, sir, but I should like to butt in. You have been to Europe?"

"Yes, sir."

"They knew you were an American?"

"They did."

"You talked with many men?"

"A great many."

"Did any of them refer to the political corruption in this country?"

"No."

"Nor to the cold-storage sharks?"

"No."

"The Beef Trust?"

"No."

"The coal robbers?"

"No."

"The extortion in express rates?"

"No."

"To the trusts in everything, even in coffins?"

"No."

"To the buying and selling of Senators?"

"No."

"Then, dear sir, will you be kind enough to tell me in which direction Europe lies and how long it will take me to get there? I want to go there instead of to heaven."—Rochester Democrat and Chronicle.

◆ ◆ ◆

Police Commissioner—If you were ordered to disperse a mob, what would you do?

Applicant—Pass around the hat, sir.

Police Commissioner—That'll do, you're engaged, sir.—Pathfinder.

◆ ◆ ◆

The Visitor—Why are you here, my misguided friend?

The Prisoner—I'm the victim of the unlucky number 13.

The Visitor—Indeed; how's that?

The Prisoner—Twelve jurors and one judge.

◆ ◆ ◆

Mrs. Bacon: "She's one of the most obstinate women I ever knew."

Mrs. Egbert: "Indeed?"

Mrs. Bacon: "Yes; why, I believe if she took laughing-gas she'd cry!"

NEW BOOKS

THE PRIMER OF HYDRAULICS—By Frederick A. Smith, Hydraulic Engineer, is a commendable work for anyone interested in the subject. The beginner, without any but a grammar-school education, will find in the first nine articles a clearly written, and easily understood introduction into the mathematical principles and methods, which must be comprehended, before the practical problems are approached; and the full-fledged hydraulic engineer will also find much in the work of great value to him in the use of the tables and methods of analysis contained therein. The book is fully illustrated and contains, besides an alphabetical index, all the tables required to solve working problems. 215 pages, 5x7½, cloth, $2.50. D. H. Anderson, Chicago.

INTRODUCTION TO ANALYTICAL MECHANICS—By Alexander Ziwet, Prof. of Mathematics, and Peter Field, Ph. D., Assistant Prof. of Mathematics, in the Univ. of Michigan. A brief introduction to mechanics for junior and senior students in colleges and universities, without applications to engineering. The nature and purpose of the work have made it necessary to omit many important subjects, but the selection made seems, on the whole, fortunate, and well adapted to give the reader a general view of the science of mechanics as a whole, and a broad enough foundation for further study. 378 pages, 5x7½, cloth, illustrated and indexed. Price $1.60 net. The Macmillan Company, New York and London.

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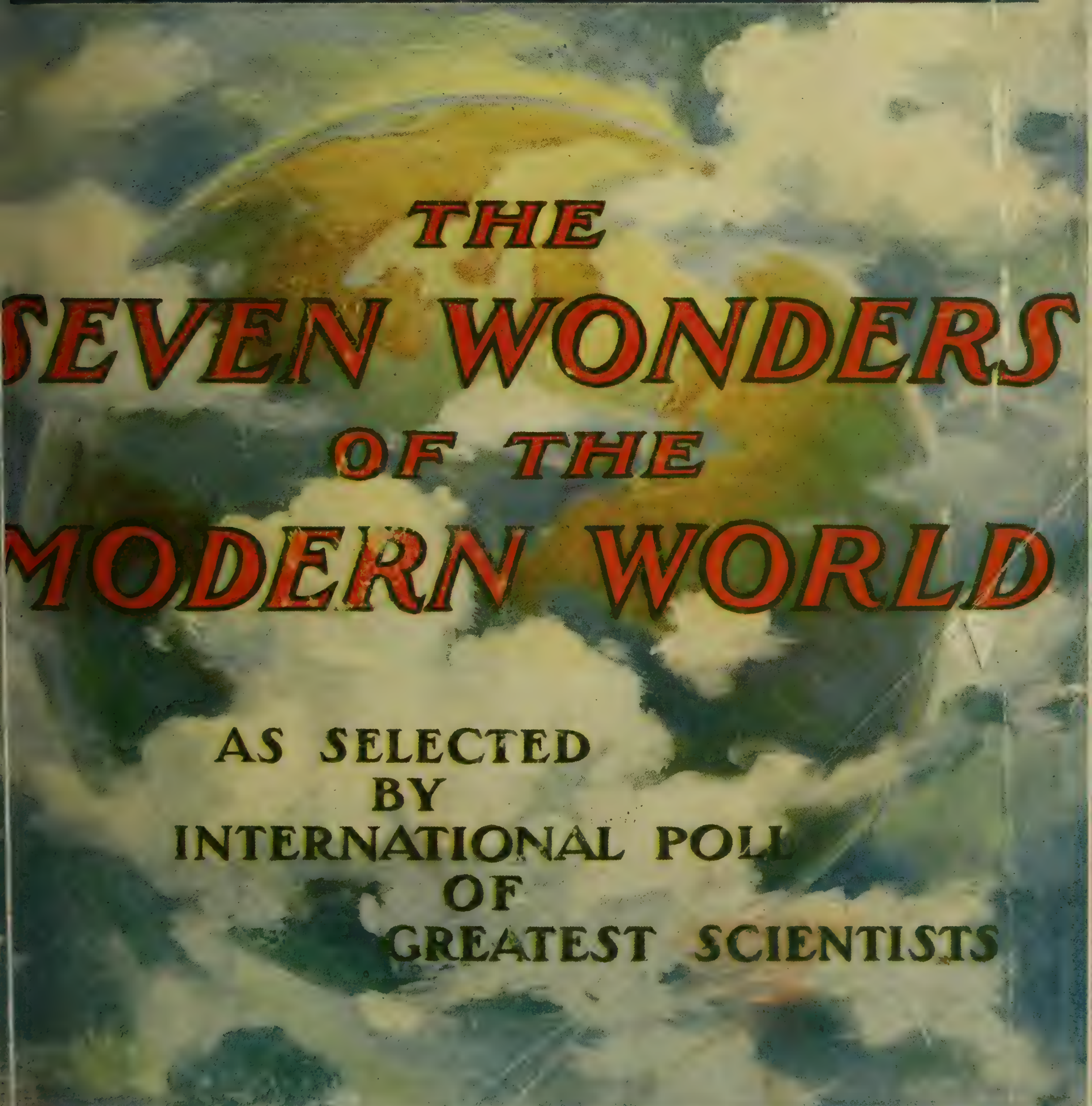

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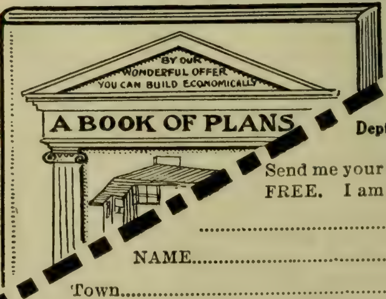
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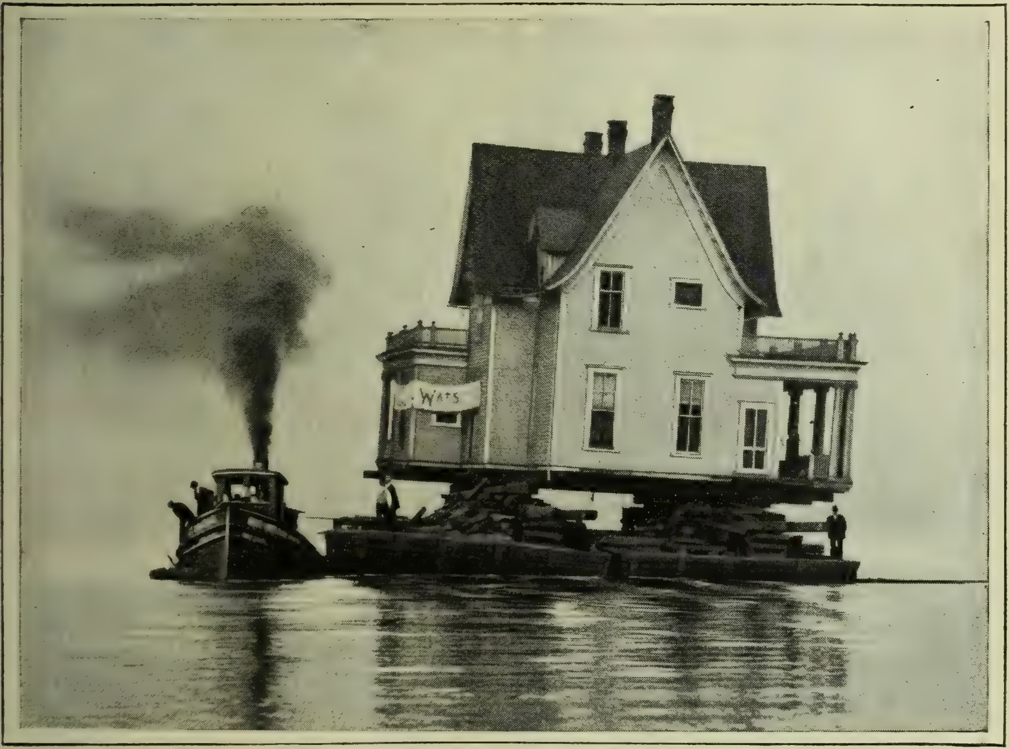
Vol. 18 AUGUST, 1912 No. 2

Lake Michigan as Highway for House-Moving



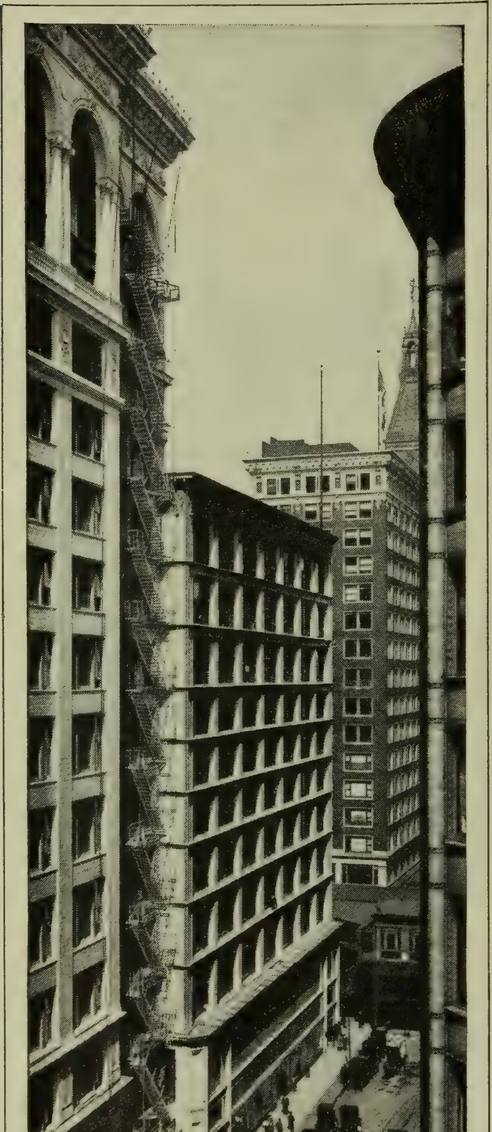
Large Two-Story House Moved on Scows Three Miles along the Shore of Lake Michigan

LAKE Michigan has proved, in one instance at least, an economical highway for house moving. The owner of a house and lot at Fifty-fourth Street and Lake Avenue, Chicago, and a lot at Lake Avenue and Seventy-seventh Street, desired to move the house to the latter, some three miles distant, but found that the moving operation, on land, would cost much more than the structure was worth. Then, convinced that he had a white elephant on his hands, he confided his troubles to a friend, who sarcastically remarked that he had better use it as a private yacht, and this gave him the idea of moving the house by water. Subsequently, the house, which is a large two-story structure, was moved over a pontoon bridge, made necessary by the shallowness of the water along the shore, and rolled onto two scows, which were towed three miles to the new location.

It took about three days of work to get the house onto and off the scows, although the lake trip was accomplished in a little less than an hour. The cost of the operation was less than $1,000.

CHICAGO SKYSCRAPER HAS RECESSED FIRE ESCAPE

A seemingly practical and rather artistic solution of the fire-escape problem on skyscrapers has been developed in the erection of a new department-store building in Chicago. A fire escape of skeleton construction clinging to the flat face of a tall building is extremely ugly from an artistic viewpoint under any condition, but this ugliness has in this instance been minimized by recessing the wall of the building where the fire escape is located. As a result the fire escape does not project over the sidewalk.



Recessed Fire Escape on the Face of Skyscraper Building; an Architectural Idea Which Eliminates Much of the Ugliness of Such Escapes

NEW WIRELESS CALLS FOR AMERICAN VESSELS

New wireless call letters, conforming to international radio-telegraphic regulations, have been issued for American merchant vessels and yachts by the Bureau of Navigation of the United States Department of Commerce and Labor, and are now effective.

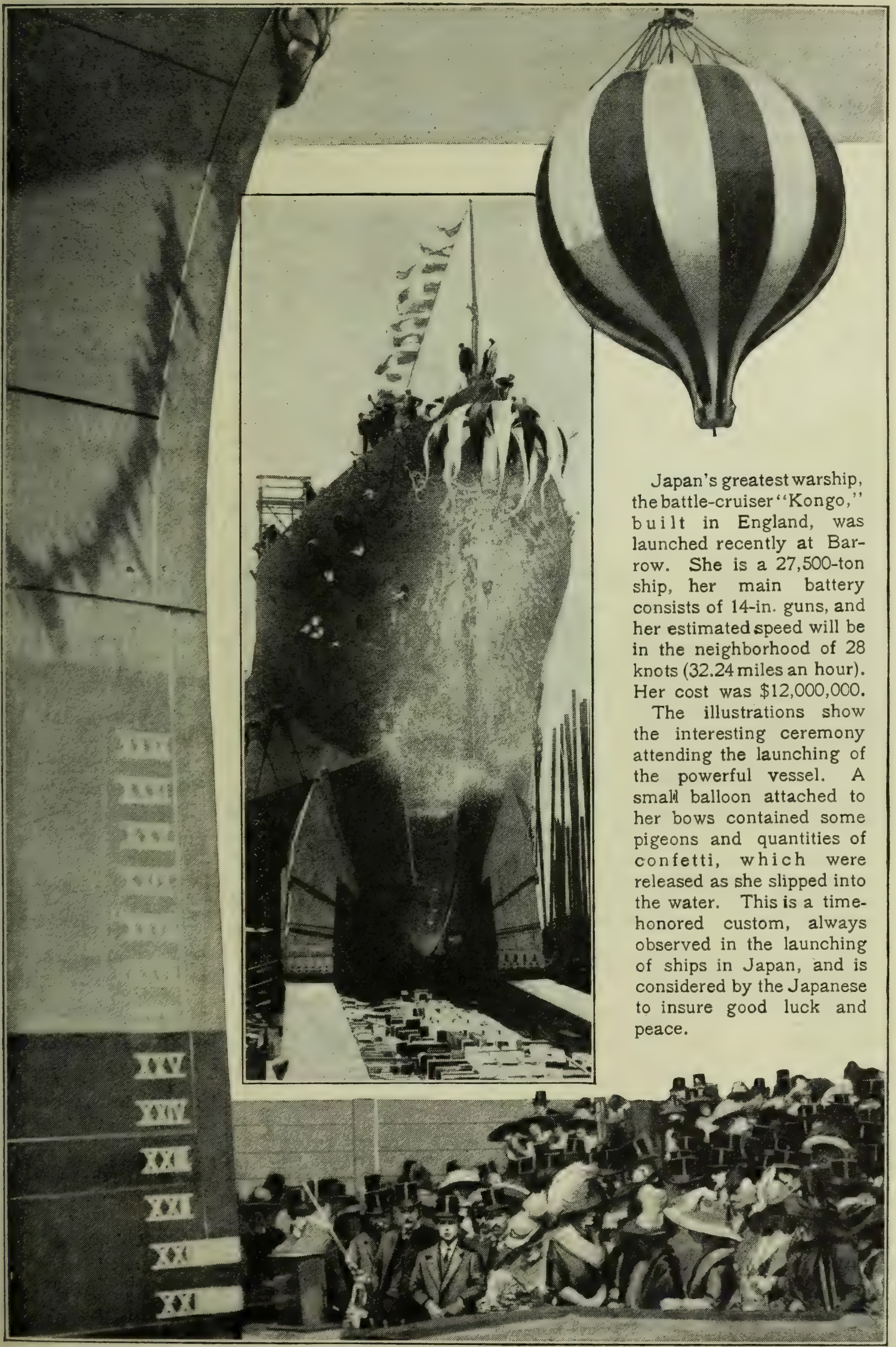
In view of the recent ratification by the Senate of the Berlin convention, the Berne bureau has consented to assign calls to American ships in advance of the London radio-telegraphic conference.

The system now adopted gives a series of three letters for each call. The letter K, as the first, is assigned to American vessels on the Atlantic Coast, and W, to vessels on the Pacific. R remains the first letter in all calls for American revenue cutters, and N, for vessels of the United States Navy. The list of shore stations with their calls has not been completed.

The letter Y, as the second letter in a group, is reserved for yachts. Hence, for instance, J. Pierpont Morgan's yacht, the "Corsair," has the call KYC, K indicating an American vessel on the Atlantic Coast; Y, a yacht, and C, the "Corsair."

¶Books for the blind printed in Esperanto with raised letters are in large demand in Europe.

LAUNCHING JAPAN'S GREATEST BATTLESHIP

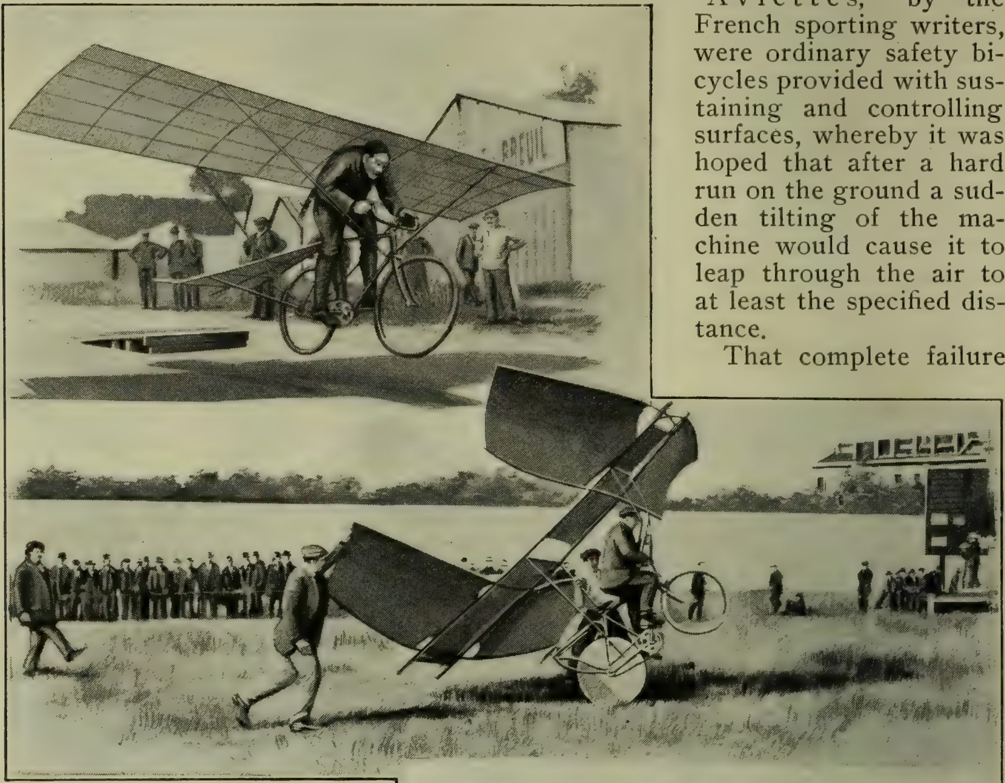


Japan's greatest warship, the battle-cruiser "Kongo," built in England, was launched recently at Barrow. She is a 27,500-ton ship, her main battery consists of 14-in. guns, and her estimated speed will be in the neighborhood of 28 knots (32.24 miles an hour). Her cost was $12,000,000.

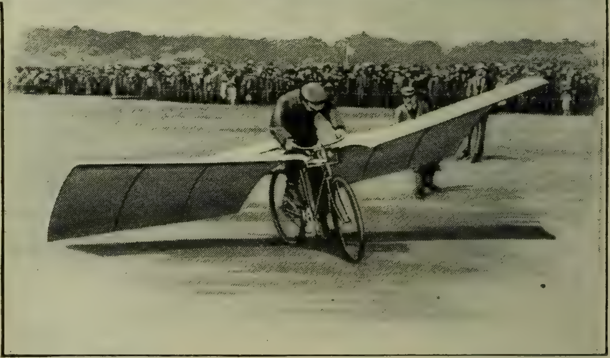
The illustrations show the interesting ceremony attending the launching of the powerful vessel. A small balloon attached to her bows contained some pigeons and quantities of confetti, which were released as she slipped into the water. This is a time-honored custom, always observed in the launching of ships in Japan, and is considered by the Japanese to insure good luck and peace.

MOTORLESS MAN-FLIGHT TESTS IN FRANCE

The first of two interesting French aviation competitions, involving a prize of $2,000 for the first accomplishment of flight by human energy alone, without a motor, has proved a distinct disappointment to the many enthusiasts who expected that its comparatively easy terms would have been readily met. The prize was for a flight of 10 meters (32.8 feet), which distance was selected by the donors on the theory that it just sufficiently exceeded the world's-record distance for a running broad jump, to demand a real flight to accomplish it. Practically all of the competitors, however, seem to have regarded it from a jumping rather than a flight standpoint, with the result that the machines entered, aptly dubbed "Aviettes," by the French sporting writers, were ordinary safety bicycles provided with sustaining and controlling surfaces, whereby it was hoped that after a hard run on the ground a sudden tilting of the machine would cause it to leap through the air to at least the specified distance.



The Upper Illustration Shows One of the Unsuccessful "Aviettes" Leaving a Jump-Off. In the Other may be Seen One of the Machines Rearing Like a Fiery Steed, the Rear Wheel Refusing to Leave the Ground



M. Moulin's "Flying Bicycle" in an Ineffectual Attempt to Leave the Ground. The Planes of This Machine are Mounted Exceptionally Low. No Amount of "Knee-Grease," would Raise the Machine into the Air

That complete failure resulted for all of the contestants seems definitely to have been due to the most crude and ignorant construction. For, though most aviation engineers are probably skeptical as to the prospect of sustained man-flight, the simple conditions of the Peugeot prize should have been easily met, while, according to a few experts of high standing, it is freely prophesied that, with the fullest application of present engineering knowledge, and with suitable refinement of design, the prize of $20,000 offered for the first flight by man power from Paris to Versailles, will be won before many months are past.

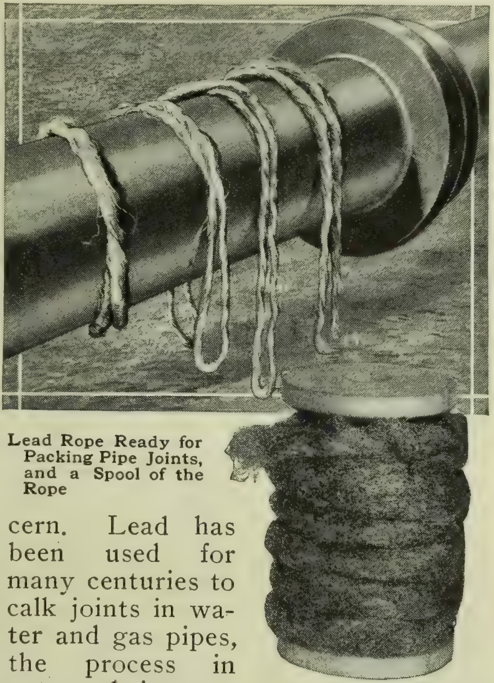
In any case, it is certain that the road to success in this interesting field of aerial endeavor must lie in scientific reduction of the forward resistances, rather than in any hope that by main force alone powerful athletes can force present types of structures through the air at sufficiently great speeds to cause them to lift.

The planes of some of the machines, according to a French writer, had an angle of incidence of 20 deg., other machines had tractive propellers 2.3 ft. in diameter, revolving something over a foot in front of the operator, and most of the planes were flat, all of which, in his judgment, is sufficient to prove that the competition could have no real interest, or any bearing on the solution of the problem. He still believes that the realization of motorless flight simply depends on the proper construction of the machine.

One of the Motorless Aeroplanes Which Failed to Fly the 32 Ft. Necessary to Win the $2,000 Prize

LEAD ROPE AND LEAD WOOL FOR CALKING

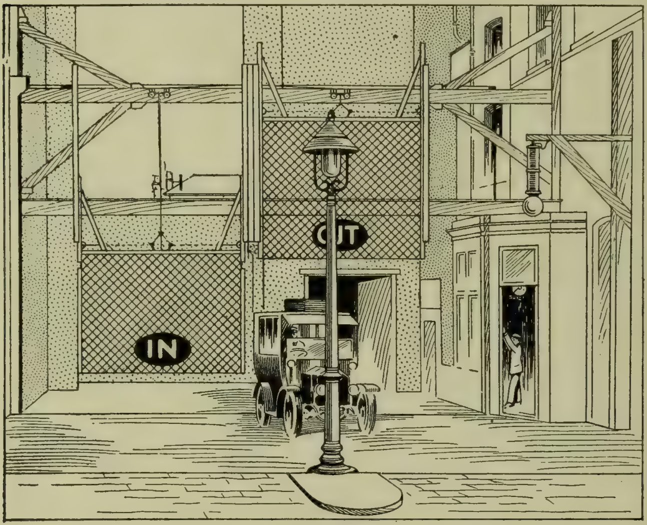
An improvement in the handling of lead for calking and repair work, has of late been made by an eastern concern. Lead has been used for many centuries to calk joints in water and gas pipes, the process in vogue being to melt the lead, pour it into the joint, and then calk or hammer the lead to expand it. Calking was necessary because the heated lead, in cooling, contracts, leaving a space between lead and hub, which can only be closed by expanding the lead.


Lead Rope Ready for Packing Pipe Joints, and a Spool of the Rope

This company has brought out lead wool and lead rope, a spool of which is herewith illustrated. Lead rope is made of specially refined lead, very finely stranded, each strand measuring .007 in. and the rope ½ in. in diameter. When hammered, this rope becomes a very dense mass, and no skill is required to pack it into joints and insure a thoroughly gas or water-proof joint. It is used cold, each length of rope being calked separately, so that the entire space at the joint is filled with lead. The advantages of using lead in this form are that a good joint can be easily made even by an unskilled workman; that the danger of injuries from melted lead is eliminated, and that the material is always ready for instant use.

NOVEL DROP GATES FOR GARAGE ENTRANCE

A garage in London, Eng., has a very novel and effective arrangement for preventing rash driving in and out of its building. There are two gates, marked "in" and "out" respectively, which can be raised and lowered, both being normally lowered. Every car wishing to enter or leave the garage is thus compelled to stop until the gate is raised, which enforces careful driving in and out, as well as enabling the timekeeper to check and record the movements of all the cars.



Drop Gates at the Entrance of a London Garage, Designed to Prevent Rash Driving In and Out

STORING OXYGEN IN AIRMEN BY INJECTION

Injecting pure oxygen gas into the blood of airmen and mountain climbers, as an auxiliary supply to that inhaled into the lungs, is a remarkable means proposed for the prevention of the so-called mountain sickness, which is due to the rarity of air at high altitudes. The preventive treatment, which was described together with the experiments confirming its efficiency at a recent session of the French Academy of Sciences, consists simply in the subcutaneous injection of small quantities of pure oxygen gas, the effect of which is claimed to persist for several days.

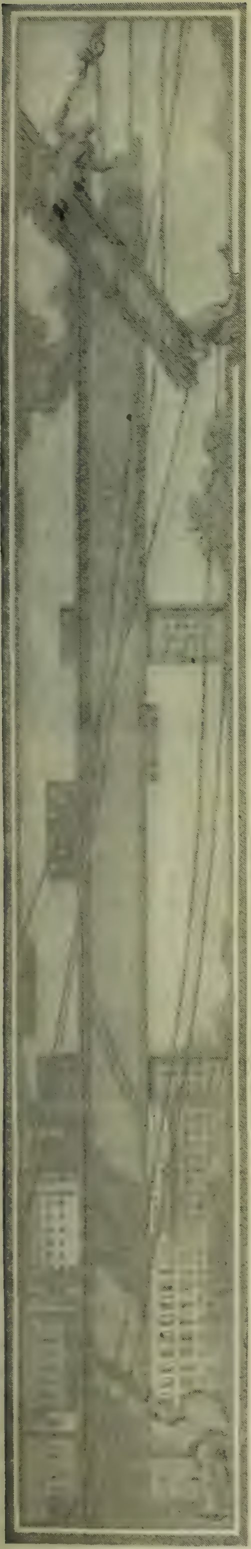
THE EMERGENCY LIGHTING OF THE "MEGANTIC"

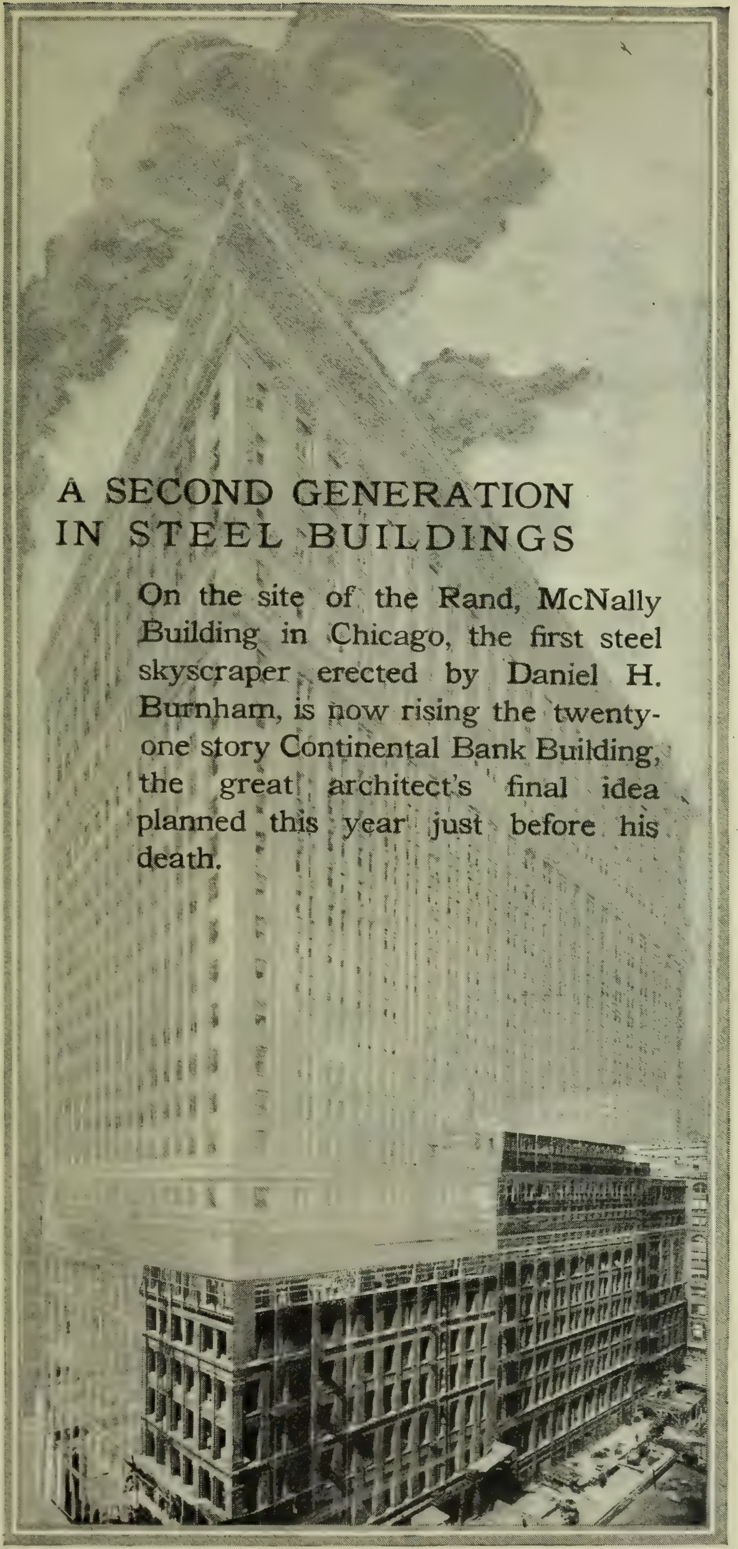
The White Star liner "Megantic," a 15,000-ton ship built three years ago for the Montreal-Liverpool route, is provided with an emergency electric-power installation which is much more progressive in its development than that on the ill-fated "Titanic." A 45-hp. Diesel marine engine, direct connected to a dynamo, is installed on one of the upper decks, and connected by separate circuit with the wireless apparatus and with electric lamps fixed in the main passages, saloons and companionways, and also in the neighborhood of the lifeboats. In case of serious disaster a supply of electricity would be available right up to the last moment when the upper deck sinks below the sea. The apparatus is set to working each day as darkness approaches and continues until daylight, quite irrespective of the fact that the steam-driven electrical dynamos are working. This is done so as to avoid any rush or hurry in starting up the plant in case of anything happening in the night.

¶A railroad report cites, as evidence of the need of a practical and infallible automatic stop for trains, figures showing that 171 persons were killed and 931 injured last year because engineers ran past danger signals.

A SECOND GENERATION IN STEEL BUILDINGS

On the site of the Rand, McNally Building in Chicago, the first steel skyscraper erected by Daniel H. Burnham, is now rising the twenty-one story Continental Bank Building, the great architect's final idea planned this year just before his death.

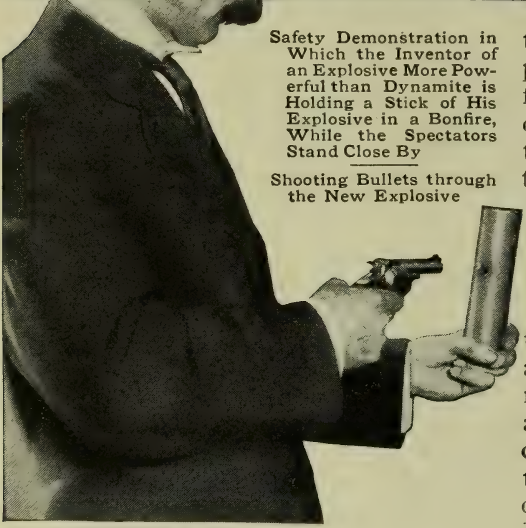




Dark Shaded Lower Section Shows Part of Old Building Not Yet Demolished

FEARLESS TESTING OF A DYNAMITE SUBSTITUTE

Safety Demonstration in Which the Inventor of an Explosive More Powerful than Dynamite is Holding a Stick of His Explosive in a Bonfire, While the Spectators Stand Close By



Shooting Bullets through the New Explosive

A new substitute for dynamite, so safe to handle that it may be shot full of holes, burned in a fire, or pounded with a hammer without danger, is being introduced into this country by an English mining engineer. And yet its rending power, ounce for ounce, is claimed to be twice that of dynamite, once it is exploded, which is possible only with a percussion cap.

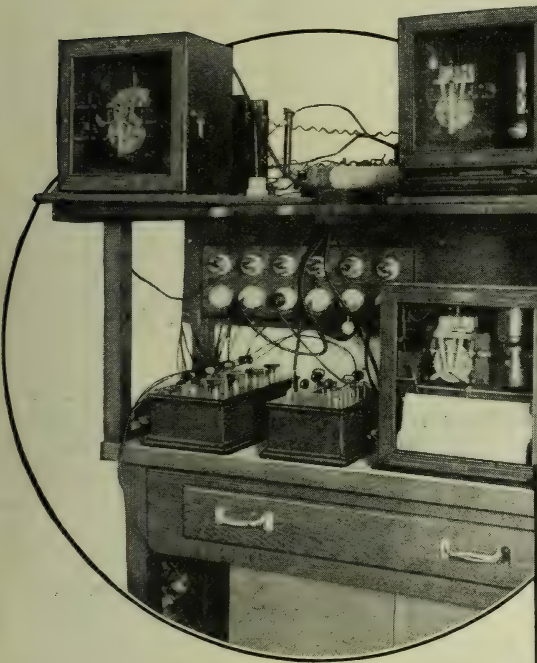
The particular interest of the illustration showing the inventor of the explosive holding the end of it in a bonfire, does not lie, however, in this demonstration of its harmlessness, but in the nonchalant air of the spectators of the test, standing but a few feet away.

AEROPLANE ACTIVITY IN THE ARMY

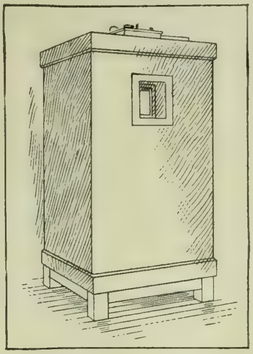
Despite the accident which caused the deaths of Lieutenant Hazlehurst and Airman Welsh, one of the Wright representatives working with the army airmen, the work of the army aerial corps is steadily progressing. Among the new departures is the installation of hydro-aeroplanes at the College Park, Md., school, where Capt. Paul W. Beck and Lieut. Joseph M. Kennedy will experiment with them.

The officers who have been training at the aviation schools at Augusta, Ga., and College Park are also called upon to put their knowledge of flight to practical use. The aeroplanes will be used, in conjunction with field artillery, to direct from aloft the fire of batteries from which the targets used to represent an enemy cannot be seen.

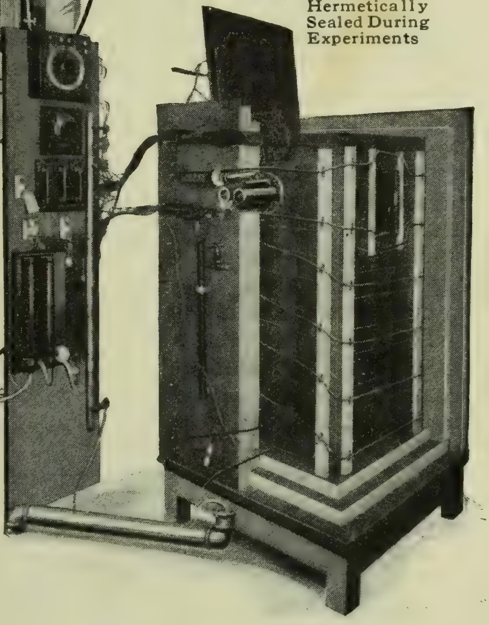
APPARATUS TO DETECT CHANGES IN FRUIT



Automatic Devices for Controlling Temperatures and Recording Temperature Differences



Exterior of the Respiration Chamber, Hermetically Sealed During Experiments



View Showing Interior of Respiration Calorimeter

Through the ingenuity of scientific men in the Office of Experiment Stations of the Department of Agriculture, an apparatus, known as the respiration calorimeter, has recently been invented to aid in the determination of changes which take place in unripe fruit and vegetables after they have been picked, stored and transported.

With an apparent greed to obtain high prices for their products in the earliest season, orchardists and truck farmers send to remote markets various kinds of unmatured fruits and vegetables. Necessarily the most scientific methods must be followed in the storing and shipping of these products to provide against great losses.

The respiration calorimeter is quite similar to the larger calorimeter which has been in use for some time, and which was designed for the study of problems as to the relation between the use man makes of his food and his efficiency as a labor producer.

The great advancement in the methods of storing and transportation which now put the summer fruits and vegetables within the reach of the consumer at all seasons of the year, requires new systems of growing crops, and very different methods in sending the garden and orchard produce great distances than are necessary or profitable for produce designed for near-by markets, where a few miles and a few hours only intervene between the picking and the final selling.

Such few experiments as have been made in the ripening of fruits by means of the calorimeter have been sufficiently enlightening to warrant an exhaustive and elaborate investigation, with the use of the same apparatus, in order to acquire better knowledge of the ferments which follow maturity, and to provide against the subsequent losses. Such knowledge would be of the utmost value to all farmers, orchardists and truckers who store and ship fruit and vegetables in large quantities.

While this calorimeter is designed especially for the study of fruit and vegetable products, it has been so constructed that the respiration chamber can be removed and another substituted for it. This would not involve any change in the recording and controlling devices, nor in other accessory apparatus. It would be possible, with minor changes, to adapt this apparatus to the study of other problems, such as, for instance, the incubation of eggs and the changes which take place in curing and storing meats and cheese.

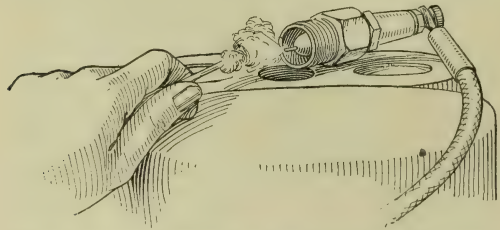
The inner or respiration chamber proper of the calorimeter consists of a double-walled, air and heat-tight copper box, 18 in. by 18 in. by 36 in., and will accommodate one bunch of bananas or a similar quantity of fruit or vegetables, which are packed in the apparatus in the same manner as when shipped to market. Surrounding the respiration chamber and separated from it by an air space is a thick outer covering, which is a poor conductor of heat, and prevents changes of temperature in the surrounding air from affecting the temperature in the chamber.

To make it air-tight the seams in the copper walls are carefully soldered, and when an experiment is in progress all openings into the chamber are hermetically sealed, while air is forced through it constantly. The outgoing air is purified of the products of the respiration, which are carbonic acid and water; and thus there is a continuous circulation and purification of air throughout any experiment. To make the apparatus heat-tight, provision has been made by which the two walls are kept at the same temperature.

Three windows are placed in the box-like affair near the top, two of which are on opposite sides, thus providing a view of the contents of the chamber, which is lighted with a small electric light. The windows are hermetically closed with sealing wax, and may easily be removed when samples are to be examined.

GETTING LIGHT FROM AN AUTOMOBILE

When it happens that a man finds himself without a match or any lighting device when darkness overtakes him and it is necessary to light the lamps on the car, there is a solution to the difficulty. Disconnect one of the spark plugs and tie a piece of cotton waste to a stick with a piece of string. Cover this liberally with gasoline and turn the starting handle slowly until the plug sparks.


Lack of Matches Need Not Prevent Automobilists from Lighting Lamps

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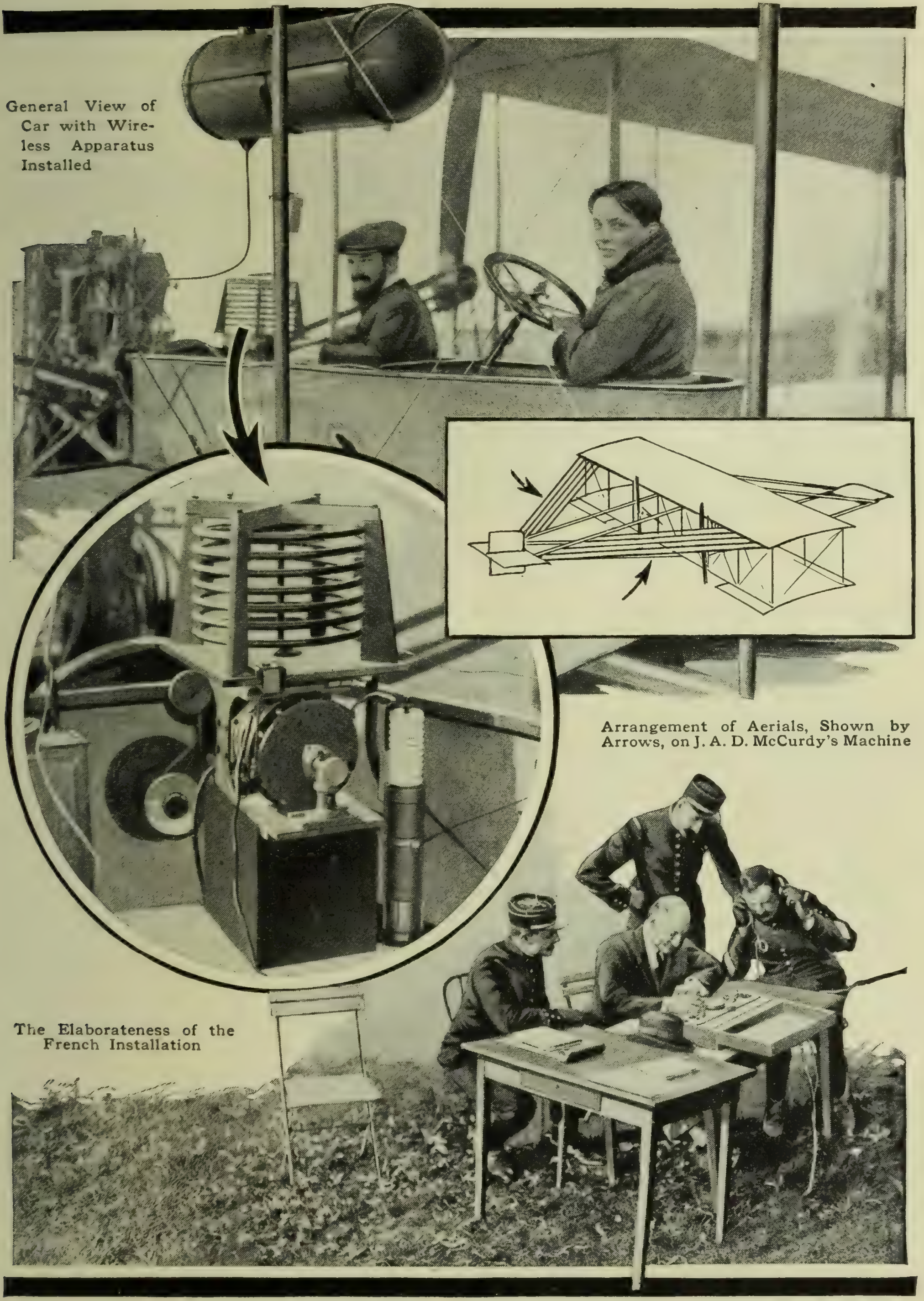
ⅭSillar, a hard compact clay, is the principal building material in the vicinity of Monterey, Mexico, the clay being cut into blocks, in much the same manner as ice is cut from lakes and rivers in the north, and buildings constructed of these blocks, being later plastered inside and outside. Sillar is cheaper than adobe mud or plaster and consequently more generally used.

NEW WIRELESS INSTALLATIONS FOR AEROPLANES

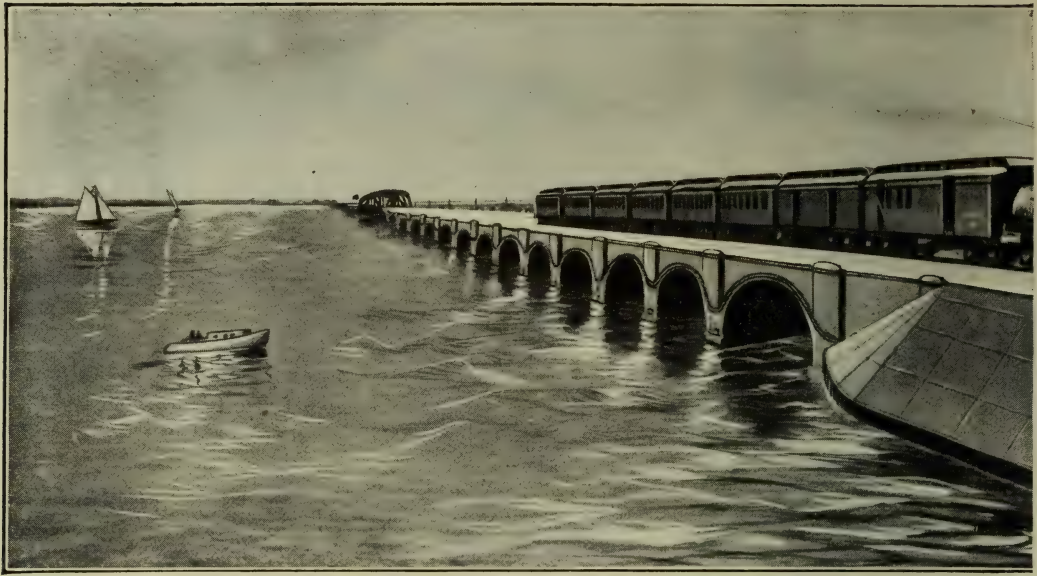


General View of Car with Wireless Apparatus Installed

Arrangement of Aerials, Shown by Arrows, on J. A. D. McCurdy's Machine

The Elaborateness of the French Installation

New wireless installations for aeroplanes, one American, the other French, are shown in the accompanying illustrations; the former, an arrangement of the aerial, is shown in the line drawing, while the three other illustrations show the French installation on a Savary aeroplane, and officers on the ground in wireless communication with it. The aerials of the American installation are rigged from the tail to the main planes of the machine, which is the idea of Airman McCurdy.

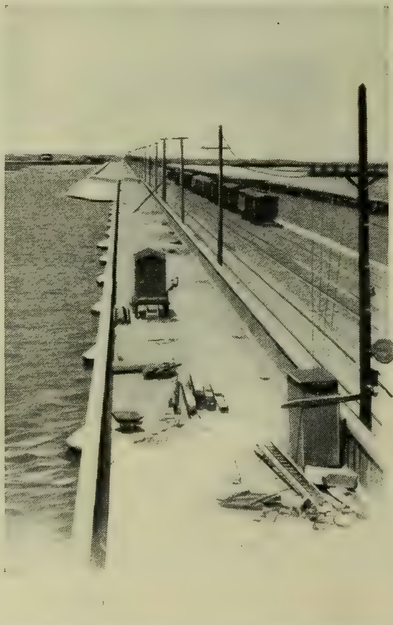


Causeway, More Than Two Miles Long, Which Now Connects the Island of Galveston, Texas, with the
Ago, and Makes Provision for Pedestrians, Vehicle

FINE-TEXTURE PAPER MADE FROM GRAPEVINES

Grapevines have been found to yield, by a special chemical treatment and the usual process of maceration, a pulp from which an excellent quality of paper can be made.

The experiments leading to the discovery were made at a French school, which is devoted exclusively to the study of paper making, and it is said that paper made from this pulp is very beautiful, has nearly the same strength as parchment, and in many respects resembles Japanese paper. It is further stated that it is particularly adapted for lithographic, chromolithographic, halftone, and other styles of art printing now in general use.

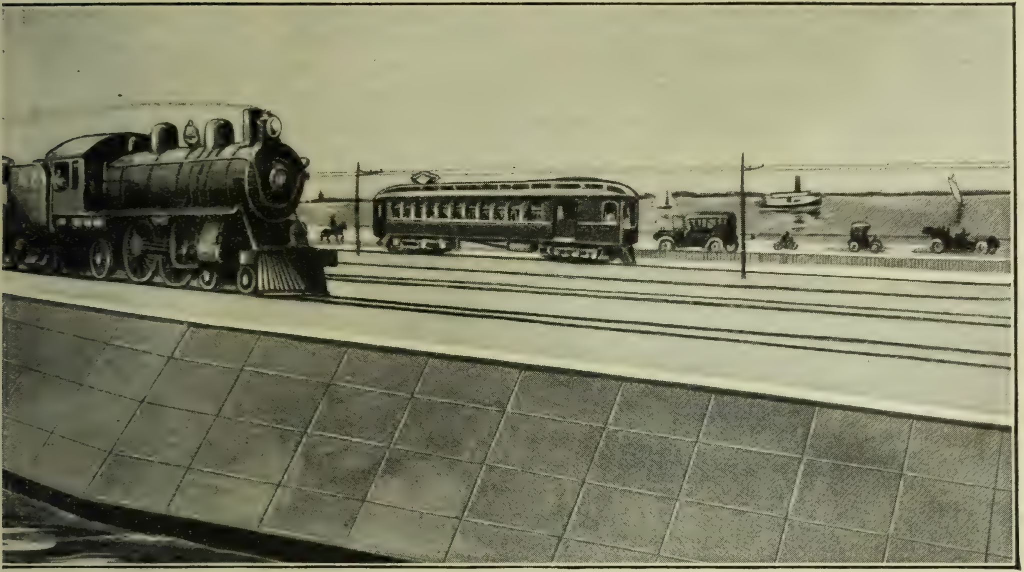


View of the Surface of the New $2,000,000 Causeway

GALVESTON'S GREAT CAUSEWAY OPENED

Galveston's $2,000,000 causeway, the third of the three great works of protective engineering planned to fortify that city against a repetition of the disaster which destroyed it in 1900, was recently opened to traffic. Governor Colquitt of Texas, at the wheel of an automobile, headed a procession of more than 1,000 cars, driving his machine through a barrier of ribbons and oleander blossoms.

The causeway stretches across Galveston Bay for 12,642 ft. Midway between mainland and island, the passage of ocean liners is permitted by a lift bridge, operated by electric motors, which leaves a clear span of 100 ft.

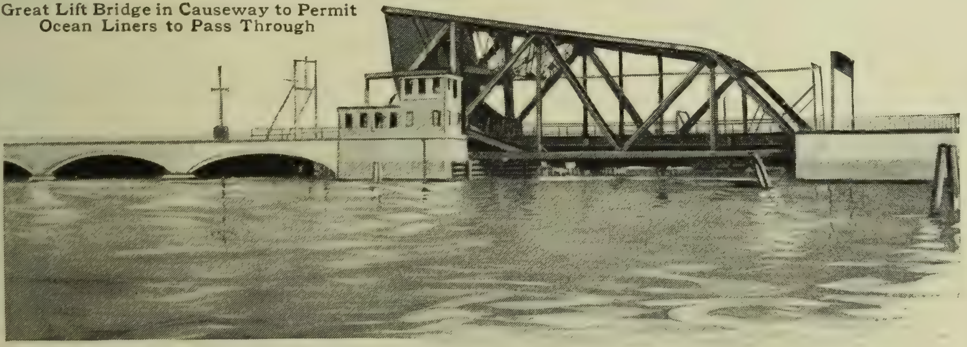


Mainland, as an Additional Protection against a Repetition of the Tidal-Wave Disaster of Twelve Years
Traffic, Electric Railways and Steam Railroads

when raised. The causeway proper, which is the filled and protected roadway approaching the arch-bridge portion from both the island and mainland ends, is 4,640 ft. long on the mainland side and 5,530 ft. on the island side. The arch-bridge portion is 2,472 ft. in length and 66 ft. in width, while the causeway proper is 110 ft. wide.

As the causeway is used by pedestrians, vehicle traffic, electric railways and steam railroads, the greatest care has to be exercised in the installation of interlocking and signal systems. Where the highway and the interurban electric road meet on the bascule bridge there has been installed an interlocking system device with gates, so that when cars are crossing, the highway approaches are automatically closed, and vice versa. The installation of the block-signal system, which is said to be the most complete anywhere in the south, cost $80,000.

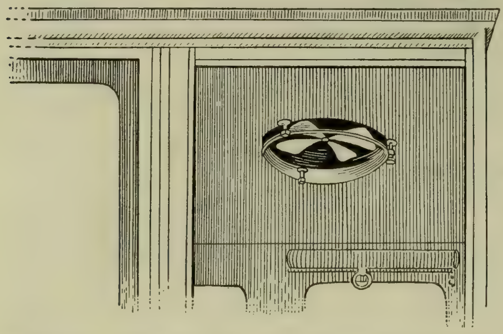
The causeway contains 2,620 tons of reinforced metal, 625 tons of tie rods, 74,000 cu. yd. of concrete, 806,600 cu. yd. of filling, 172,081 lin. ft. of concrete piling, and 246,820 lin. ft. of lumber piling.



Great Lift Bridge in Causeway to Permit Ocean Liners to Pass Through

MAHARAJAH'S VENTILATOR AN AUTO FEATURE

New features in motor-car construction would hardly be looked for in the remote domain of the Maharajah of Rewah, yet in the accompanying illustration may be seen the electric ventilator fan fitted in the roof of the Maharajah's new 38-hp. car. The fan is arranged to suck air in through the ventilation louvers and propel it into the car, the fan being controlled by a convenient switch. A heavy, basin-shaped glass disk is suspended from the roof a short distance below the fan, so as to form a deflector for distributing the air and overcoming the discomfort of a direct draft from the fan.



East Indian Potentate's Device to Ventilate His Car

AMERICAN AIR DEATH RATE IS THE HIGHEST

Twenty-five per cent of the fatal aeroplane accidents are due to the lack of ability of the pilots of the machines, in the opinion of Major Roche of the French Army Aviation Corps. He classifies the causes of accidents under seven general heads. About one-third of the accidents he finds to have been caused by faulty construction of the machines, which the French critic divides under two heads. Lack of proper rigidity and solidity of construction, he believes, causes collapse of about 20 per cent of the machines that fall, and 13 per cent break because of radical errors of construction. Acrobatic displays in the air claim 6 per cent of the victims, he states; 10 to 12 per cent lose their lives through unfavorable conditions of the atmosphere; lack of presence of mind causes 6 per cent, and 13 per cent are due to improper education of the pilots, while no cause is ascribed for the remaining 5 per cent of fatalities.

The experts of L'Aéro, the French aviation daily, find that more fatal accidents occur in the United States than elsewhere, in proportion to the number of licensed airmen. In France, where there are some 600 licensed pilots, there have been 27 fatal accidents, or 4.5 per cent of the total number of pilots have been killed. The table prepared by L'Aéro of the four principal countries interested in aviation shows:

Country	Licenses	Deaths	Percentage
France	600	27	4.5
Great Britain	168	6	3.57
Germany	133	13	9.77
United States	70	12	17.44

Fourteen deaths have been added to the list since the figures given by Major Roche and L'Aéro were compiled. A woman's name is found for the first time on the American record of victims of aeroplane accidents. Miss Julia Clark was fatally injured at the State Fair Grounds, Springfield, Ill., June 17. Miss Clark attempted to make a circuit of the field where an aviation meet was in progress late in the evening. Her machine caught in a tree and was upset, the young woman pilot being thrown to the ground with such force that she died within a few minutes after the accident.

Lieutenant L. W. Hazlehurst of the U. S. Army Aviation Corps and A. T. Welch, one of the Wright experts, were killed by the fall of a machine they were testing at College Park, Md., June 11. They were endeavoring to make a climbing test with a new aeroplane and the machine collapsed while they were 100 ft. in the air. The necks of both men were broken. Another American, Victor L. Mason, was killed in an accident at Brooklands, England, May 13, when an English aviator, E. V. Fisher, also met his death. Mr. Mason had gone aloft as a passenger with Mr. Fisher when the machine broke. Ray Wheeler, an amateur of St. Louis, Mo., collided with a telegraph pole while making a flight at Kinloch, Mo., and was killed by the resultant fall. In France there were a number of serious accidents. A machine capsized when only 50 ft. from the ground at Juvisy, June 1, and the airman, Edouard Roby, was instantly killed. On June 9, M. Kimmerling, one of the best known pilots in France, was killed at the Mourmelon field while flying with a passenger, M. Tonnel, who also lost his life. The machine collapsed at a height of 300 ft. Captain Dubois and Lieutenant Albert Peignan were the victims of a collision in midair, June 19. The two officers were flying in opposite directions, making a circuit of the field, at Douai, France. Through some miscalculation their machines collided and both fell, being instantly killed. In Germany, Lieutenant von Schlichting was killed at the Johannisthal aerodrome, by a fall of about 40 ft., May 26, and Herr Buchstaetler and Lieutenant Stille, of the German aviation corps, met their death in an accident at Berlin, June 1.

SUBMERGED PIT FOR COAL STORAGE

An electric power plant in Omaha, Neb., stores its emergency supply of coal in a 6,000-ton submerged pit having several interesting features. The pit is supported by piles driven through quicksand to rock, a reinforced concrete wall was erected as a fire protection, and steel rails are imbedded in the concrete floor of the pit to protect it from the bite of the grab bucket. The coal is stored under water to prevent the possibility of spontaneous combustion.

RODIN'S HEAD OF FRANCE

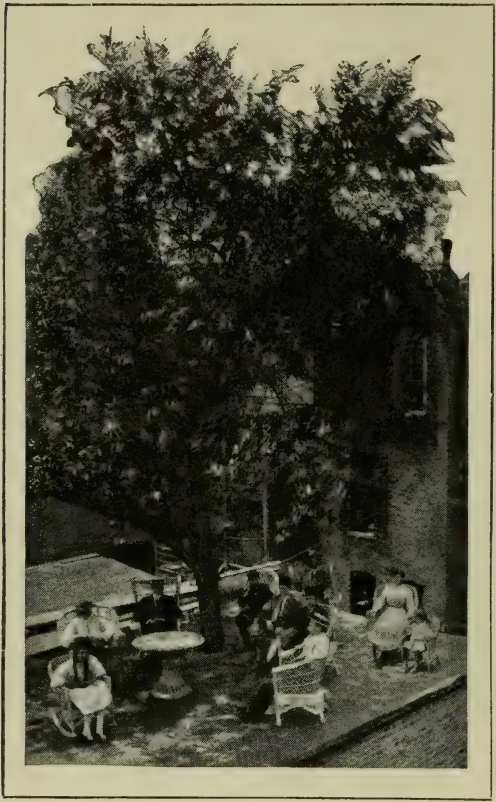
The head of the bronze statue which rises from the socle, or base, of the Champlain Monument, close beside the main shaft, the gift of France to America, is a wonderful example of modern sculpture. M. Hanotaux, ex-minister and a member of the French presentation committee, said of the statue in his speech at the inauguration of the monument, that "with its face, at the same time smiling and grave; its pure and delicate features; its firm expression, indicating resolve and sincerity, it may well be said to represent a French Minerva."

France, as Conceived by the Great Sculptor Rodin for the Champlain Monument

ℭGerman theatrical managers, actors and playwrights are taking steps to stop the onslaught of motion pictures, which have practically captured the theatrical business in Germany, even the Kaiser's Imperial Theater having adopted this form of entertainment. The theatrical managers think the pictures should be restricted to educational and scientific subjects.

INTERESTING ROOF-TREE GARDEN

A roof garden, probably unique in Chicago, is shown in the accompanying illustration. In erecting a one-story flat-topped building in his back yard, the owner did not wish to destroy a large tree, so built the structure around it, and then realized that he had a fine roof garden for the enjoyment of his family and friends.



A Structure with a Very Unusual Roof Tree, Which Provides an Excellent Roof Garden

BACTERIA THAT THRIVE ON A DIET OF IRON

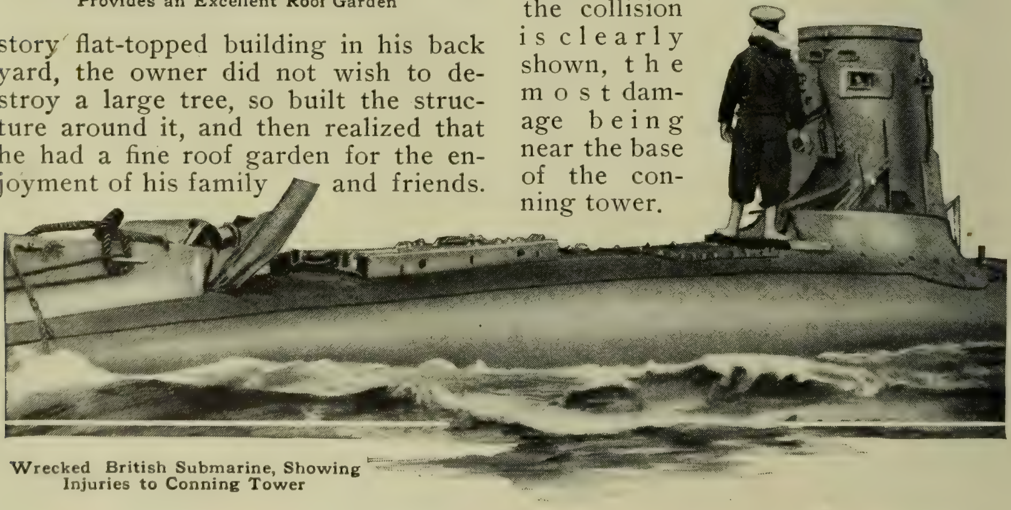
Professor S. N. Vinogradskij and H. Molisch have announced, in Berlin, their discovery of a remarkable species of bacteria, which grows only in solutions that contain carbonate of iron.

Another striking faculty of these iron germs, is that, in the total absence of other sources of carbon, they are capable of extracting carbon from carbonic acid.

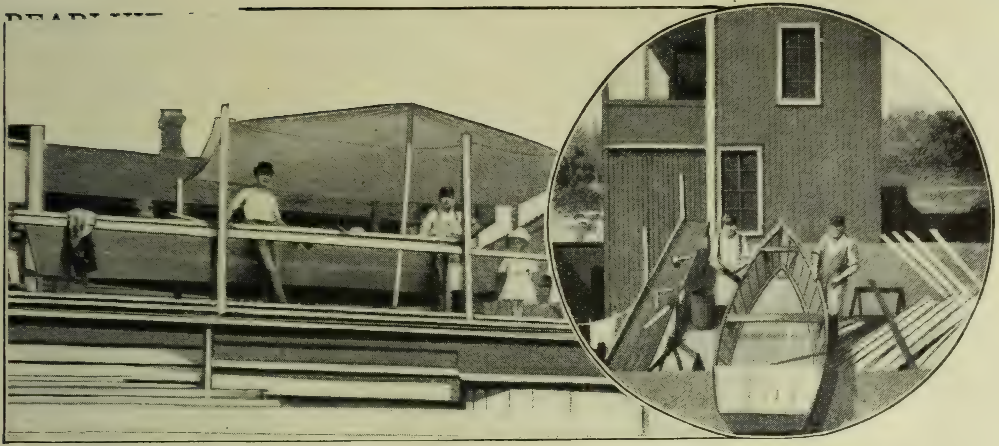
To a germ-nourishing medium, holding inorganic salts in solution, iron filings were added and carbonic-acid gas supplied to the extent of one per cent of the air in the flask. With inorganic salts, metallic iron, and no other source of carbon, there was a great increase in the carbon present in the culture. Great masses of the iron bacteria were formed by growth and multiplication. The microbes, in order to gain one part of carbon, produce from iron carbonate no less than seven hundred parts of oxide of iron.

THE ILL-FATED SUBMARINE "A 3" AFTER RAISING

The accompanying illustration of the British submarine "A 3" shows the little vessel soon after she had been raised. The damage which sent her to the bottom with her entire crew a moment after the collision is clearly shown, the most damage being near the base of the conning tower.



Wrecked British Submarine, Showing Injuries to Conning Tower



A Motorboat Being Built under an Awning Rigged across the Clothesline Posts on a Roof

The Crew of the Boat Actively at Work Close Beside One of Chicago's Elevated Railways

BOAT-BUILDING IN UNUSUAL PLACES

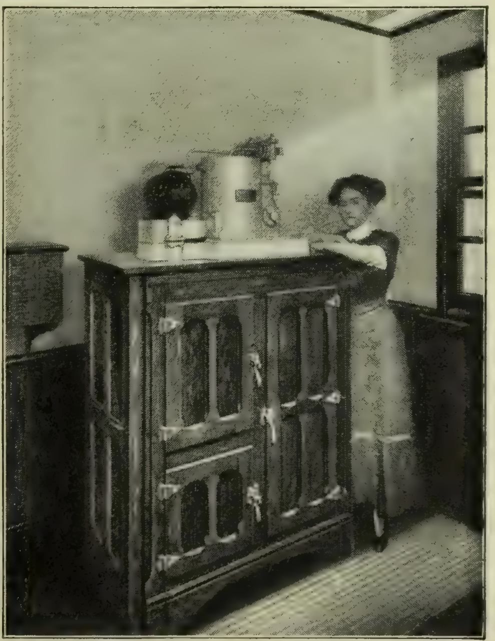
Passengers on Chicago elevated railways now and then catch a glimpse of odd shops in queer places, and boat building may be included in the construction activities thus glanced. In the accompanying illustrations is shown a motorboat while being built on a roof at the back of an apartment house. It is a 20-ft. boat which will be provided with a 6-hp. engine. On completion this boat was swung onto a truck in the alley and carted to the Lake Michigan shore for launching.

ELECTRIC REFRIGERATION FOR THE HOME

The conversion of the ordinary box refrigerator into an artificially cooled refrigerator is made possible by the installation of the electric refrigerating and ice-making machine shown mounted on the top of a house refrigerator in the accompanying illustration.

The outfit is about 3 ft. in length, 2½ ft. in height, weighs, complete, 150 lb., and has a 200-lb. capacity. The operating cost is said not to exceed 10 cents per day. It keeps the refrigerator cool all the time; does away with the dirt and slop incident to the use of ice; there are no drip pans or drain pipes to think about, and the interior of the refrigerator is always clean and sanitary. The moisture in the air inclosed in the refrigerator, or admitted to it upon opening the doors, is precipitated upon the outside of the brine tank in the form of a hard white frost.

The machine is operated by a 1/6-hp. motor, the refrigerator is connected with the water supply of the house, and the ammonia need not be renewed

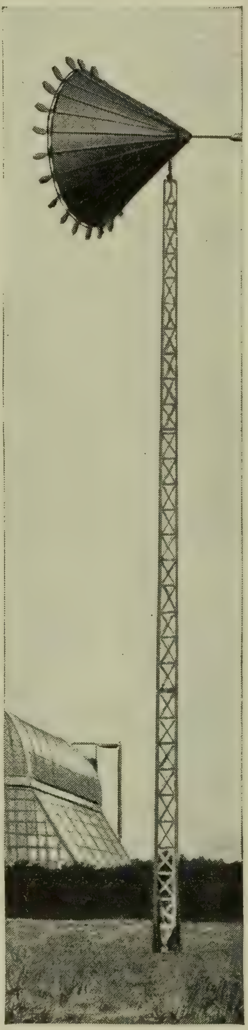


The Electric Ice-Making and Refrigerating Machine Mounted on the Top of the Ordinary House Refrigerator oftener than once in six months. Anyone can recharge the machine with ammonia by attaching a new filled drum, which is furnished in exchange for the empty drum for the price of the ammonia, which is about 50 cents.

The refrigeration is automatic. A thermostat, set at the degree of temperature desired, controls the electric current, regulating it automatically when the temperature varies from the desired degree of refrigeration.

ANCHOR MAST FOR DIRIGIBLES

One of the most ingenious means yet developed for anchoring or mooring dirigible balloons is shown in the accompanying illustration. It is one of the anchor or mooring masts for army dirigibles at Aldershot, England, and is located near the hangar. At the top of the mast is a pivotally mounted cone into which the balloon's nose fits.



RAISING MINK FOR FUR

The raising of wild animals for their fur is a subject of such general interest that the Biological Survey of the Department of Agriculture has been led to conduct experiments in the breeding of mink at the National Zoological Park in Washington. The survey wishes to ascertain whether rearing the animals in captivity can be made commercially successful. The experiments seek to supply facts in regard to their housing, feeding, mating, and in general to determine the best methods of caring for the animals. Preliminary hints on mink farming can now be obtained from the Department of Agriculture.

GERMAN ARTIFICIAL SANDSTONE

An artificial sandstone, said to be harder than the natural, and particularly adapted as a material for garden statues, fountains, grave monuments, and other outside sculptures, is being manufactured by a concern in Germany. The new stone is, according to "Die Woche," absolutely weather-resisting as well as considerably harder than natural sandstone, and can be worked in exactly the same manner as the latter. It is made in any desired grain or texture, and can be colored, without the use of foreign coloring substances, into a perfect imitation of the genuine French limestone.

The cost of the artificial sandstone is said to be about half that of the natural.

THE HYDROELECTRIC POWER FROM VICTORIA FALLS

The hydroelectric power company which controls most of the power derived from the Victoria Falls, of the Zambesi River, Rhodesia, Africa, will, by the close of this year, be operating four power stations having an aggregate capacity of 156,000 hp. Additional plants, now in construction by the company, will increase the capacity to 232,000 hp., all of which has already been contracted for.

The available water power at the Victoria Falls is far greater than that of Niagara.

BEARLIKE SHEPHERD DOGS OF THE PYRENEES

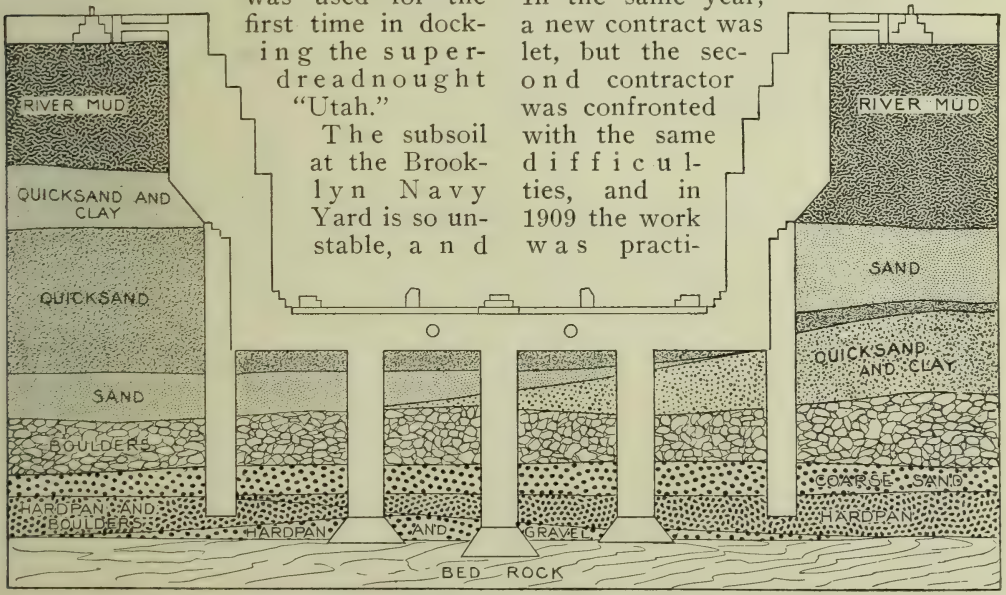
It has already been noted by scientists that certain mountain dogs have shapes and assume attributes reminding of a bear's. Among these dogs the sheep dog of the Pyrenees bears a closer resemblance to the bear than most others. Although he is seldom over 20 in. high, his bones are very massive and his muscles exceptionally developed. His fur is thick, consisting of long, fine, silky hair, either black, dun-colored, or gray. His head is large and the nose tapering, the eyes small but sharp and lustrous, his ears always "attentive." The toes and the base of the feet are elongated and flat. The tail is very short, or even entirely missing, and by his manner of climbing the abrupt mountain slopes in quest of some strayed member of his flock, he may easily be mistaken for a young bear.

Dog of the Pyrenees Which has Developed Many Bearlike Features

NAVY'S GREAT DRYDOCK AT LAST COMPLETED

The great drydock at the Brooklyn Navy Yard, the first appropriation for which was made in 1900, has at last been completed, after having been twice given up by contractors, and was used for the first time in docking the superdreadnought "Utah."

The subsoil at the Brooklyn Navy Yard is so unstable, and the surface so extensively underlaid with quicksand, that the task proved a very difficult engineering work. The first contractor encountered shifting sands and abandoned the work in 1908. In the same year, a new contract was let, but the second contractor was confronted with the same difficulties, and in 1909 the work was practi-



The Navy's Great Drydock at the Brooklyn Navy Yard is Supported by Massive Concrete Piers Extending Down through Quicksand to Bed Rock. Length of Dock, 726 Ft.; Width, 110 Ft.

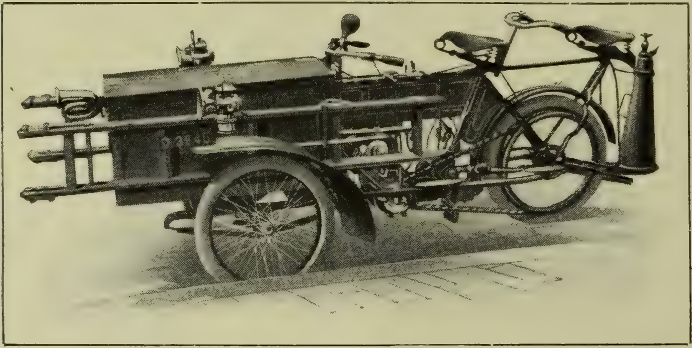
cally abandoned the second time. In October, 1909, the contract was awarded the third and last time, the contracting concern pushing it through to a successful completion.

The drydock as now completed is adequate for the docking of the largest battleships America is likely to construct for many years. The first contract called for a dock 554 ft. in length, capable of taking a ship 506 ft. long and 91 ft. beam. At the time of the second contract the size was increased to 620 ft. in over-all length, and the final contract was for a dock 726 ft. in length, with a width of 110 ft.

The plan of construction which proved successful was novel and somewhat radical for drydock construction. It consisted of sinking the outer wall of the dock to bedrock, or, where bedrock could not be reached by the pneumatic method, to the hardpan and boulders, and to carry the floor, which is 8 ft. thick, upon lines of massive piers, also sunk to bedrock. The outer wall was sunk in caissons, each 36 ft. long by 5 ft. wide. The floor-supporting piers, which are 7 ft. square, flaring out toward the base, which is 11 ft. square, were sunk in three rows.

AN ENGLISH MOTORCYCLE FIRE TRUCK

A motorcycle fire truck, exceptionally complete in its equipment, is used at the Beckenham fire station, London, for emergency work. The machine, which is three-wheeled, has two seats, one for the driver and the other for the fireman; a fire extinguisher and hose, scaling ladders, and a "first-aid" equipment. The outfit can travel at a speed of 40 miles an hour, and has proved its practicability in rendering service before the arrival of the main fire-fighting apparatus.



Motorcycle Fire Truck Equipped with Chemical, Hose, Scaling Ladders First-Aid-to-the-Injured, Etc.

ℭThe British post office has adopted the night-lettergram service for telegraph lines in the British Isles.

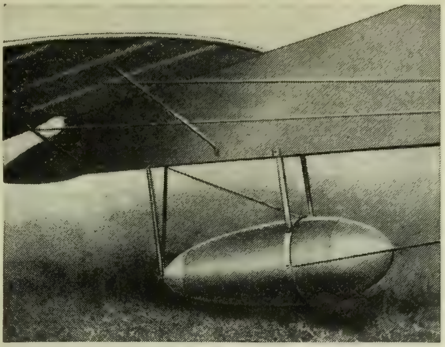
POWER PLANT SUPPORTS LAKE PLEASURE RESORT

Creating an artificial lake to provide a pleasure resort for the public, and paying for it by selling the electric power which will be developed, is the project now being carried out by the city of Austin, Texas. Construction is in progress on a reinforced concrete dam across the Colorado River at a point just outside the city limits, which will form a large artificial lake and provide a storage supply of water for generating a minimum of 6,000-hp. The dam will replace a similar structure that was erected about 14 years ago and which was destroyed by a flood in 1900. The new dam will be 5 ft. higher than the old and of a stronger type of construction. It will be 1,100 ft. long and back the water through a chain of picturesque hills for a distance of about 30 miles. This body of water will have an average width of about 1,500 ft., and a mean depth of about 40 ft.

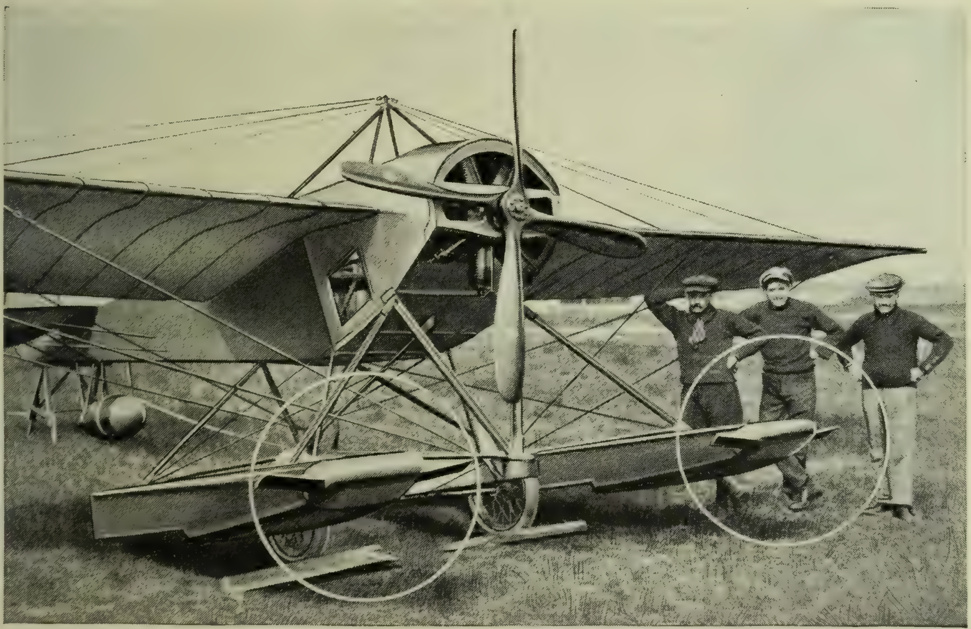
While it is expected that this hydroelectric enterprise will be of much benefit to the people of Austin by providing cheap light and power, the primary incentive that brought about the arrangements for the construction of the dam was to establish a pleasure resort. The cost of the dam and power plant will amount to $1,720,000, which sum the city has undertaken to pay, in semiannual installments, covering a period of 25 years, out of the revenue expected to be derived from the water and light plants, without having to resort to any bond issue.

THE FIRST HYDRO-MONOPLANE

The Nieuport hydro-monoplane, which underwent recent tests in France under the direction of Lieutenant Delage, is the first monoplane equipped for landing on and rising from the water. It will probably be one of the hydro-aeroplane types adopted by the French navy. The floats are of a novel design, not at all like the pontoons used on biplanes in America and in England. The two forward floats have hydroplane-type bottoms, and small wooden wings or planes extending out like the fins at the back of a fish's head. The tail portion of the monoplane is supported on the water by an elongated egg-shaped float.

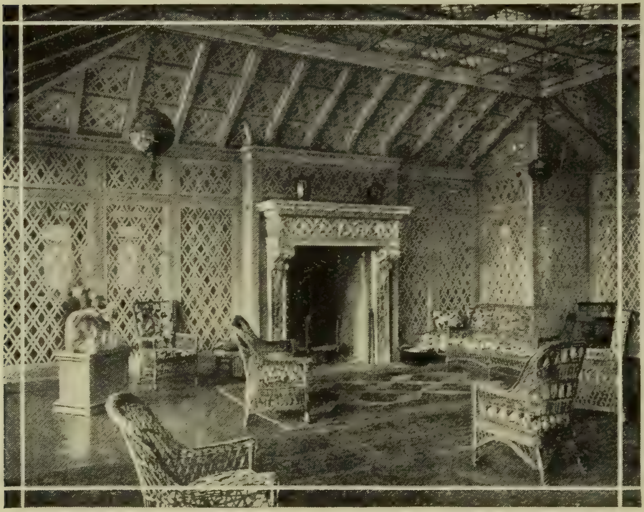

The Tail of the Nieuport Monoplane with Its Elongated Egg-Shaped Support

ℭThe final stone has recently been laid in the system of breakwaters in the harbor of Colombo, Ceylon, completing a work commenced in 1875, which cost $15,000,000, incloses one square mile of water, and gives Colombo one of the largest artificial harbors in the world.


Front View, Showing the Supporting Floats of the First Hydro-Monoplane

ARTISTIC TRELLIS-WORK SUN ROOM

In the New York City residence of Mrs. E. H. Harriman is an exceptionally artistic sun room, done completely in trellis work of pleasing design. The metal-work globes containing the electric lamps, the sculptured fireplace, and the wicker furniture give the whole a very delightful effect.



Courtesy International Studio

The Exceptionally Artistic Trellis-Work Sun Room in the New York City Residence of Mrs. E. H. Harriman

NEW YORK'S WATER SUPPLY STERILIZED WITH LIME

The sterilization of New York's water supply with hypochlorite of lime is, according to the Engineering Record, undertaken on a larger scale than ever before attempted. The plant at Dunwoodie will tap both the old and the new Croton aqueducts and apply a solution of the chemical to the water delivered each day to the Boroughs of Manhattan and Bronx. The daily flow thus sterilized may reach a maximum of 380,000,000 gallons.

This arrangement for sterilization is, of course, but temporary, pending the erection of a permanent filtration plant, for which plans are now in course of preparation.

MONSTER TUNNEL PROJECT FOR CENTRAL GERMANY

A railroad tunnel, from 15 to 19 miles in length, in the very heart of Germany has recently been proposed by the Braunschweig Commerce association. The Harz Mountains form an obstacle in the way of rapid transit between points in northern and southern Germany, and as an ordinary road over the mountains would present very considerable technical difficulties, a tunnel is judged much more feasible, and the cost is estimated at the comparatively reasonable sum of $6,000,000. An express train would be able to run through the tunnel in less than an hour and the gain in time for freight traffic would be of great value.

Beside these direct advantages, the surveyors of the projected tunnel are convinced that water courses will be met with during the tunneling which could be used for power purposes, and that many valuable ore deposits will be discovered, the Harz Mountains being one of Germany's richest ore-bearing regions. Silver, iron, lead, copper, zinc, etc., are mined at various points, and marble, alabaster and granite quarried.

GERMAN AIR-CRAFT INSURANCE

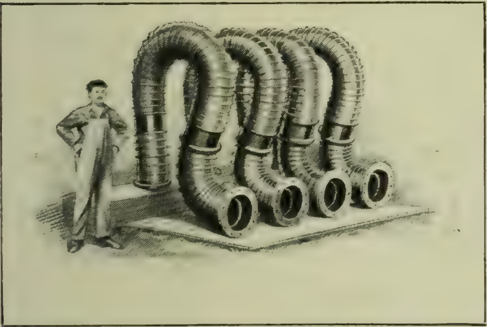
The several German life and accident insurance companies, which have been underwriting aerial risks during the past few years, are all at present restricting their operations, the experience up to date having proved discouraging. Rates of insurance against liability for damages, arising from injury to persons and property inflicted during flights, have been made almost prohibitive; insurance of aeroplane operators against death seems to have been abandoned altogether; the rates for insurance of balloonists have been recently increased, and at present the number of policies of any kind in this class is exceptionally small.

A Swiss insurance company doing business in Germany, which wrote about 100 policies during the two years it experimented in the field, has now abandoned all classes of aerial insurance. Its original rate against death was $110 per year for a $2,380 policy, and for an accident insurance giving a daily indemnity of $2.40 during invalidity the same premium was exacted.

METAL "GOOSE-NECK" TUBES OF GREAT ELASTICITY

A Polish engineer, M. Maciejewski, has recently constructed a machine for producing flexible metal tubes or pipe, by means of parallel corrugations in the metal, for use as conduits of various kinds, and in fire-tube boilers. The tubes are so flexible that they can be easily bent into elbow or goose-neck shape, as shown by the illustration, from which the size of the tubes may be judged.

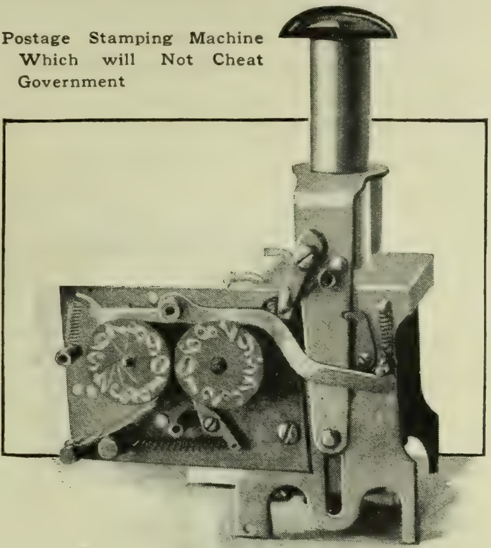
These tubes will effectively withstand internal shocks, such as water hammer, and the like, and their longitudinal elasticity naturally eliminates the necessity of expansion joints. It is claimed that a fire-tube boiler in which these tubes are used will cost considerably less than if built in the ordinary manner.



Polish Invention of Tubes Which may be Bent into Goose-Neck Shapes

TO ELIMINATE THE POSTAGE STAMP

A little machine has been invented by a Los Angeles inventor which is intended to eliminate the postage stamp, with the bother of licking the little labels or messing with a damp sponge. It should be of considerable value to the business man who sends out a large mail, and in the case of mail-order firms should effect a saving in time and energy on the part of clerks.



Postage Stamping Machine Which will Not Cheat Government

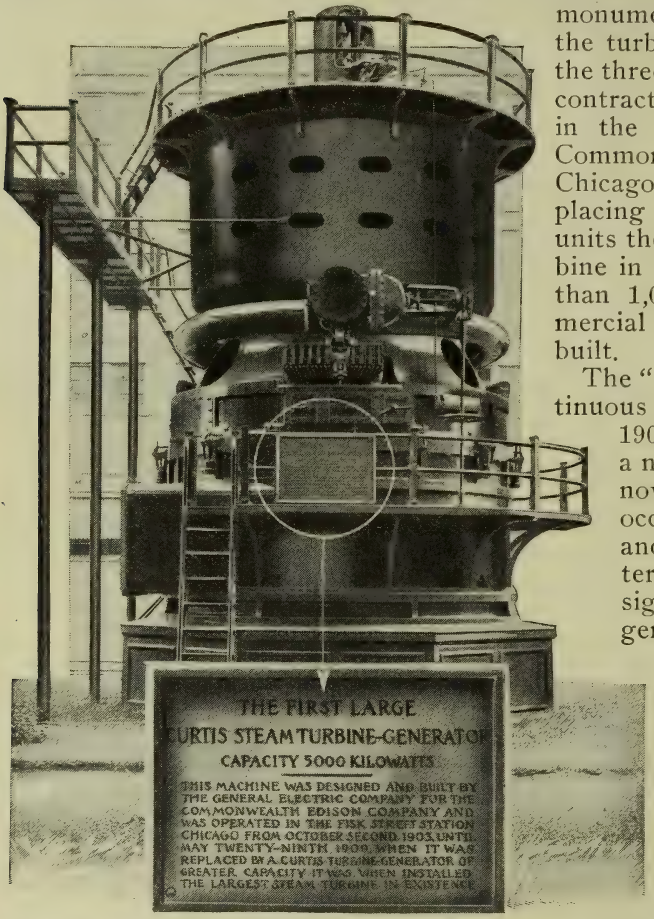
The device makes an imprint similar to the "postage paid" permits printed on envelopes, which have already proven their value and are in constantly increasing use. The difference is that this device can be operated in the office and imprinted on any envelope and used from day to day as required. It is locked after being set for a certain number of imprints and can be adjusted up to 10,000. When the given number of imprints has been stamped, no more impressions can be made until the case is opened and the machine reset. It is proposed by the inventor to have the Post Office Department authorize its use, and in that event the business man will secure a machine with any desired number of imprints, paying for them as if they were so many stamps. Any denomination can be imprinted of course. In case the two-cent imprint is in use in a given machine, overweight letters can be stamped with two or more impressions to make up the desired amount of postage.

THE FIRST GREAT TURBINE BECOMES A MONUMENT

The first great steam turbine, with its original stairways and galleries, now stands in the middle of a grass plot in front of the turbine department of the General Electric Company's plant at Schenectady, N. Y., as a monument to the development of the turbine. The machine is one of the three 5,000-kilowatt turbine units contracted for in 1901, and installed in the Fisk Street station of the Commonwealth Edison Company of Chicago, in 1903. Previous to the placing of the contract for these units there was not a generating turbine in the world of larger capacity than 1,000 kilowatts, and no commercial Curtis turbines had been built.

The "monument" was used in continuous service from 1903 until May, 1909, when it was replaced by a new and larger turbine, which now operates in the same space occupied by its predecessor, and which, from the same battery of boilers originally designed to provide power for generating 5,000 kilowatts, delivers 14,000 kilowatts for considerable periods of time.

The monument commemorates the great step in engineering which was marked by its installation as a power unit in 1903.


THE FIRST LARGE
URTIS STEAM TURBINE-GENERATO
CAPACITY 5000 KILOWATTS
THIS MACHINE WAS DESIGNED AND BUILT BY THE GENERAL ELECTRIC COMPANY FOR THE COMMONWEALTH EDISON COMPANY AND WAS OPERATED IN THE FISK STREET STATION CHICAGO FROM OCTOBER SECOND 1903 UNTIL MAY TWENTY-NINTH 1909 WHEN IT WAS REPLACED BY A CURTIS TURBINE-GENERATOR OF GREATER CAPACITY IT WAS WHEN INSTALLED THE LARGEST STEAM TURBINE IN EXISTENCE

The First Great Turbine; Erected in Front of the General Electric Company's Schenectady Plant to Commemorate the Progress in Turbine Development

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¶Steel trolley wire is a recent product of the wire manufacturers.

ELECTRICITY IN A LOS ANGELES FESTIVAL

To the wonderful pageants of the carnival at Nice, the Mardi Gras of New Orleans, and the Midwinter Rose Tournament of Pasadena, must be added the Fiesta de los Flores of Los Angeles, an event that takes place in the middle of May, when Southern California is at its best. This year the Fiesta was observed with unusual display, as it took place during the national conclave of the Shriners, and a whole week of festivity caused the regular business of the city to be suspended.

The finest feature of the Fiesta was due to electricity, for it was conceded that the electrical night parades were the most striking part of the entertainment. Fifteen floats, costing $1,000 each, and carrying thousands of incandescent lights, were sent through the streets for three successive evenings. These floats were built upon trolley flatcars and were sent along the street-railway tracks the same as street cars, receiving power and light from the overhead wires, and dispensing with the horses that add nothing to the beauty of a pageant. The most weird and wonderful designs were chosen for subjects, such as the "Love Bug," "Giant Grasshopper," "Flying Fish," "Monoplane" and "Honey Bee." The "American Eagle" was one of the finest and most spectacular, with the huge golden bird mounted upon a red, white and blue shield, all the colors being masses of light.

By means of flashers, the light was sent in waves through the designs of some floats, such as the rocket, which gave the effect of bursting fireworks. Other floats had mechanical devices which moved the various parts; thus the fish appeared to be swimming, while the stork "rubbered" at the crowds on both sides of the street, and stretched its neck. Of course, pretty girls were in evidence upon the floats, and their charms afforded the only serious rival to the beauty of the electric display.

"American Eagle," Electric Float in Los Angeles Fiesta, the Eagle Standing on an American Shield

The "Love Bug," One of the Floats in the Los Angeles Fiesta Which Obtained Weird Effect by Flashing Lights

BLASTING RAIN CLOUDS WITH DYNAMITE

Sections of Texas which have been handicapped by drought have turned to the ancient scheme of using high explosives to blast moisture from the clouds and give dying crops relief from the burning sun. For weeks a large part of the great state was totally without rain. A northern manufacturer who has a large estate in one section of the state, when threatened with loss of his crops, bought $1,000 worth of dynamite and sent up bombs filled with it. Copious rain followed. The apparent success that attended these efforts aroused the people of other sections. The residents of Wichita Falls made up a purse and purchased some 6,000 lb. of explosive. Wichita Falls was about to go bankrupt because of the lack of rain, and water was needed forthwith. The dynamite was exploded in large charges, but no rain came. When the last of it had gone without result and the people were wondering what to do next, telegrams began to arrive from surrounding sections thanking the Wichita Falls people for their kindness, as rain in large quantities had fallen in many places, though not a drop had laid the dust in the vicinity of the town where the work to get it was performed. The Texas people have great faith in dynamite, however, and several communities have already subscribed to funds with which to purchase it and try to blow a few drops of rain out of the otherwise clear sky.

SHOOTING BUTTERFLIES WITH ARROWS

The great butterfly "troides chimera," which often has a wing spread of 5 or 6 in., is hunted by the natives of New Guinea with bow and arrows. The arrows, which the natives also use for killing small birds, are four-pronged.

Courtesy Illustrated London News

Shooting Great Butterflies with Arrows in New Guinea

ⅭIt is estimated that the Mississippi River has added 1,200 square miles of area to the continent of North America by the deposits it has made in the Gulf of Mexico.

WAVE-ACTION PRESSURES ON BREAKWATERS

It is a well-known fact that the impact of a wave on the face or top of a breakwater formed of blocks of masonry or concrete may cause such a block to become loosened from its seat and move in the opposite direction to that of impact, even to the extent of being actually pushed out of its position, although it may weigh several tons besides carrying the weight of adjoining blocks, states the London Times.

This effect may be explained either by assuming that wave pressure on the face of the breakwater at the instant of impact is transmitted, as in the hydraulic press, to every portion of the interior, thus giving rise to an excess outward pressure at those portions of the face over which the wave is not at the instant breaking; or by the compression of air which is entrapped in the open joints, such a compression causing an internal pressure, which is maintained for a short period of time after the recession of the wave has relieved the pressure on the face.

Experiments carried on at University College, Dundee, indicate that, assuming a maximum velocity of wave impact of 80 ft. per second, the maximum internal pressure to be anticipated through hydrostatic transmission of the impact is about 2.9 tons per square foot, while, in the case of air compression, the pressure may reach about 6 tons per square foot. The experiments also show that, in circumstances favoring such an effect, the impact of the wave on an open joint gives rise to a water-hammer action, far more violent than either internal water pressure or air pressure, and the force of which may amount to some 40 tons to the square foot.

It is suggested that a free outlet by means of a series of drains or weep holes, opening out on the sheltered face of the breakwater, be provided for the water that may percolate to the interior of such a structure, in order to relieve such strains.

THE SPIRIT OF THE MODERN WONDERS

MAN'S THOUGHT APPLIED TO THE SERVICE OF MANKIND

"To the Ancients, a wonder had to be fashioned with the strong arm; its virtues were chiefly those of size and strength. The Modern Wonders find their inspiration in the service of human life—every human life,—and their conception in minds, not in muscle."

EDITOR'S NOTE

THE Editor of Popular Mechanics Magazine invited nearly one thousand scientists, representing every European and American school of advanced thought, to participate by ballot in the selection of seven wonders of the modern world. A ballot was prepared containing 56 subjects of scientific and mechanical achievement. There were blank spaces for the insertion of any other subject the voter might desire. Each of the eminent men to whom the ballots were sent was requested to indicate the seven that appeared to him to be the most wonderful. He was under no obligation to accept any of those on the list. He was assured that his name would not be used in connection with the publication of the result, which, of course, precludes the printing of the list herewith.

The American scientists were selected after consultation with the Secretary of the American Academy of Sciences, Dr. L. O. Howard of Washington, D. C.; the European authorities consulted were members, either of the Royal Society of London, the French Academy of Science, or the faculties of the great German universities. The response received was cordial. About 70 per cent of the ballots sent out were marked and returned. These came from the most distinguished men of the entire group, the names of many of whom are household words throughout the civilized world. Several eminent men hesitated to select seven individual forms of progress as the most wonderful, and a number of letters were received commending the enterprise, but declining to put their writers on record for the reason that any titles selected would be, to their minds, in many instances results of some general element of modern progress, such as electrical development, chemical research or civil engineering, and not, therefore, entitled to place as separate wonders. A class of 50 professors, instructors and advanced students of the department of chemistry of Cornell University, by a supplementary ballot, selected a list of seven things, five of which are to be found on the list which represents the consensus of opinion of the entire voting. Only one ballot, the last to be received, which bore the name of one of the most distinguished authorities on chemistry of Munich, Germany, was checked for the seven titles the total vote showed to have been selected. Six ballots, one from India, two from France, two from Germany and one from the United States, showed the selection of six of the final seven. The international character of the poll and the wide diversity of opinion of the men chosen to participate in it resulted in some remarkable answers, and in a scattering of votes over a wide range of human achievement, so that the subject which received the largest number of votes was selected by a little more than 35 per cent of the scientists voting and the seventh on the final list by but a trifle more than 17 per cent. The final analysis of the poll shows the ten subjects highest on the list were:

Wireless Telegraphy	244	Spectrum Analysis	126
Telephone	185	X-Ray	111
Aeroplane	167	Panama Canal	100
Radium	165	Anesthesia	94
Antiseptics and Antitoxins	140	Synthetic Chemistry	81

THE SEVEN WONDERS OF THE MODERN WORLD

Result of the International Poll of Scientists

1. **Wireless**
2. **Telephone**
3. **Aeroplane**
4. **Radium**
5. **Antiseptics and Antitoxins**
6. **Spectrum Analysis**
7. **X-Ray**

THE Seven Wonders of the Modern World!

It were a far easier task for even the learned men who shared in the selection to name seven score than seven. On every hand, by night, by day, we walk and see and breathe amid a multitude of wonders, which are no wonders to us, but only commonplace, because a part of our everyday existence. Today an infant's feeble voice finds its unerring way along a tiny wire across rivers and over plains and mountains to the one home in millions it seeks. To us no wonder, and our young men and women cannot recall the time before the telephone was. They use without a thought, an instrument before which the Seven Wise Men would have prostrated themselves as a thing supernatural.

The Seven Ancient Wonders were selected by the Greeks, and their right to the title was established before Christ was born. During all the intervening years no attempt has been made to definitely revise the "Seven Wonders." Generation after generation has come and gone accepting the decision one from the other. In fact there was no opportunity for a revision. As the years increased civilization ebbed and about all the man-made marvels we have to show for those 2,000 years of human life are a few cathedrals and pictures.

Of the ancient wonders only one was a practical utility—Pharos, the 400-foot lighthouse of Alexandria; one was a hanging garden, not for the people, but built by a queen for her sensual pleasure; two were tombs; one was a temple of beauty devoted to a heathen god; another, the Colossus of Rhodes, was a freakish mass of cast metal, less than half the height of our own Statue of Liberty, and not comparable in dignity; and one was a beautiful statue to typify certain æsthetic ideals. Not a single one created for the uplifting or well-being of the masses.

As brute force, represented in vast armies, was the measure of power, so the Ancients honored the strong arm and the mighty, inert mass. It would seem that the pent-up forces of civilization, held in, thrust back, ruthlessly cut down for 20 centuries, had finally burst forth to fill the 19th century with wonders. And the greatest of these are neither connected oceans, mountains thrust through with tunnels, towering structures each housing the population of a city, floating palaces, land vehicles that outdistance the eagle, nor any of the things which typify the might of muscle. On the contrary each modern wonder is a monument to the might of mind.

As we move out into the 20th century we are pushed on by a tremendous

THE SEVEN WONDERS OF THE ANCIENT WORLD

Pyramids of Egypt
Pharos of Alexandri
Hanging Gardens of Babylon
Temple of Diana at Ephesus
Statue of Jupiter by Phidias
Mausoleum of Artemisia
Colossus of Rhodes

momentum of scientific and mechanical and physiological knowledge of which the Ancients were utterly incapable to even dream.

Shall we contrast the Ancient Wonders and our Modern?

The Panama Canal: An engineering feat so stupendous as to find its equal only in Nature herself—is not thought worthy to be one of the Seven Modern Wonders. And yet Colonel Goethals with his men and machines could erect a mass in a few weeks which would put to insignificance the Great Pyramid, to build which required 100,000 men for 20 years. And when completed it was only a resting place for a few human bones which have long since been desecrated and scattered. The Panama Canal will for all time be of real service to all the peoples of the earth and to republics yet unborn, bringing food in time of famine from lands of plenty to those in want, and by reason of accessibility make alien nations neighbors. Yet this accomplishment with all its mighty possibilities is less a wonder than the story brought by a single ray of light from the smallest star as related by the Spectrum Analysis.

The Hanging Gardens of Babylon—the artificial mountain in a monotonous plain—built by slaves; devoted to the riotous revelry of a wicked court; its beauty known throughout the world: Yet this lofty, hand-made height sinks into smallness beside a single phial of antitoxin as it triumphs over the disease of some poor unfortunate outcast whose pain-racked body the ambulance rescues from the slums.

What is a cold marble statue, however beautiful and stately, to those quivering waves which Marconi snatched from out of space and wove into invisible chords that tether the ships of the seas to ten million firesides!

What even the beauties of the Temple of Diana to the beauties and yet unknown blessings of radium?

The wonder of our Modern Wonders is the thing itself—not the instrument. To the Ancients, a wonder had to be fashioned with the strong arm; its virtues were chiefly those of size and strength. The Modern Wonders find their inspiration in an improvement of human life—every human life—and their conception in minds, not in muscle.

The Seven Wonders! What will they be in the 40th century, when the scientists of those days look back and review the seven wonders which we select today? Unquestionably we can as little forecast or comprehend the Seven Wonders of the Then, as the Ancients, brought to life today, could comprehend the things we know. With all our vaunted conquests we reach out into twenty centuries yet to come with the same feeble comprehension that takes us back to those greatest of all Seven Wonders,—the wonders recorded in the first chapter of Genesis.

H. H. WINDSOR

Essential Parts of First Bell Telephone — 1876

Modern Telephone Instrument

Alexander Graham Bell's First Telephone

THE TELEPHONE

By ALEXANDER GRAHAM BELL

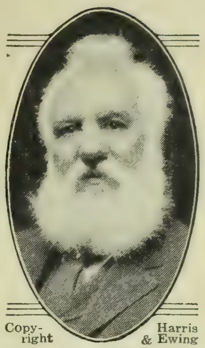
Inventor of the Telephone

THE period that marks the incipiency of the telephone was the years 1874 to 1877. From 1873 until the beginning of 1876, I was a resident of Salem, Mass., and came into Boston every day for my professional work. Then I would spend my summer vacations in Canada, at Brantford, Ontario, the home of my parents. So these three places, Salem, Boston, and Brantford, are concerned in the early days of the telephone. Boston is par excellence the home of the telephone, for it was there that all the apparatus was made and the important experiments carried on. Brantford was my thinking place, where I would go and spend my summer holidays and review the line of experiments made in Boston, and plan for the future of the work.

Right in the beginning I want to state that while I invented the telephone, credit for much of its development belongs to a number of able and conscientious co-workers, and men who came into the work later.

During the summer of 1874, while on a visit at my father's home at Brantford, and discussing with my father the numerous experiments I had made relative to the reproduction of musical sounds by electricity for the purposes of multiple telegraphy, the thought of the membrane telephone was elaborated. So that the conception of the telephone originated in Brantford. It was a theoretical conception of the magneto telephone,—that the vibrations of the voice might create electrical impulses like the aerial impulses and produce an audible result at the other end.

To tell the truth, as a practical man, I did not quite believe it; as a theoretical man, I saw a speaking telephone by which we could have the means of transmitting speech and reproducing it in distant places. But it really seemed too good to be true, that one could possibly create, by the action of the voice itself, electrical impulses intense enough to serve any practical purpose.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Professor Alexander Graham Bell

And so, on my return to Boston, in October, and all through the winter and spring of 1875, instead of making the apparatus and experimenting, I was attempting to devise methods of increasing the strength of these electrical undulations. Then came the discovery that a magneto-electric current would produce by itself sonorous effects at a receiving station. In a moment all the difficulties in the way of a practical solution of the telephone disappeared. We had only one membrane telephone, and the receiver was one of the old tuned-reed receivers. It was held up to the ear and you crammed the armature against the ear to dampen its vibrations. I was listening at the armature while Mr. Thos. A. Watson, my assistant, was in the basement of the building on Court Street, Boston, shouting at the membrane telephone. I may say that I heard nothing. Then we changed instruments and he listened while I spoke, and while I was thus engaged, Mr. Watson came rushing upstairs in a state of great excitement, saying, "Why, Mr. Bell, I heard your voice very distinctly and could almost understand what you said."

Well, that was gratifying, but it

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would have been still more gratifying if I, too, could have heard that. The workshop in which we were experimenting was a very noisy place and Mr. Watson was accustomed to that noise and could hear a good deal better than I could. I was more accustomed to throwing out my voice than Mr. Watson, so that he had the advantage of me in hearing and I had the advantage of him in speaking. The results would be considered very unsatisfactory at the present time; yet, encouraged by the results, poor as they were, I went ahead immediately to prepare specifications for a patent. The specifications for the patent were ready in October, 1875, but were not filed until later.

After the granting of the patent came a period of publication. In cases of new inventions, we are generally led to believe that the public is ready to swallow anything, and that grave scientific men are the most skeptical of all. In the case of the telephone I found this not to be true. The public generally and the business men of the country were very slow to perceive any value in the telephone. The scientific world, on the other hand, took it up at once.

The telephone was exhibited at the Centennial Exhibition in Philadelphia in 1876. I must admit that at that time I was not very much alive to commercial matters—not being a business man myself, but conducting a school of vocal physiology in Boston. I was right in the midst of examinations. My pupils, those studying under me, were working to become teachers of the deaf, and I could not be bothered at that time by having to go to Philadelphia and attend the exhibition. I finally decided, however, that I could take a Sunday off, and run down to Philadelphia. I was an unknown man, and looked around upon the celebrities who were the judges there, and followed them while they examined this exhibit and that exhibit. Mine came last. Before they got to it, it was announced that the judges were too tired to make any further examination that day. That meant that the telephone would not be seen, for I had resolved to return to Boston immediately.

And that was the way the matter stood, when suddenly there was one man among the judges who happened to remember me by sight. That was no less a person than Dom Pedro, then Emperor of Brazil. I had shown him what we had been doing in teaching speech to the deaf in Boston, and when he saw me he remembered me.

"Mr. Bell, how are the deaf-mutes of Boston?" he asked. I said they were very well and told him that the next exhibit on the program was my device. "Come along," he said, and he took my arm and marched off with me, and, of course, where an emperor led the other judges followed. And thus the telephone exhibit was saved.

The emperor held the receiving end of the line and I was told that he suddenly started and said, "My God, it speaks." He put it down, and then Sir William Thomson, the great English scientist, took it up and listened. I have reason to suspect, from some contemporary documents I have examined, that this was not quite what happened, but as I was not present at the receiving end of the line I cannot of my own knowledge state what did take place. I was at the transmitting end and suddenly I heard a noise of people stamping toward me and there was Dom Pedro rushing along at a very un-emperorlike gait, followed by Sir William Thomson and others, to see what I was doing at the other end.

Developments followed rapidly and the first reciprocal communications occurred in Boston, in 1876. On October 9, that year, the first conversation by telephone between persons separated by miles of space took place. This was between a manufacturing company in Cambridgeport and its office in Boston. It was not a very long distance, probably 2½ miles, but communication was carried on freely.

WIRELESS

By F. MINTURN SAMMIS

Chief Engineer in America of the Marconi System and Assistant to Marconi in the Early Improvements of the Original Invention

AS wireless telegraphy grips the imagination of men more and more by its ever growing wonders, so does the marvel increase that its inventor developed and achieved his epoch-making idea when he was in age but a schoolboy, expected to do no more than study his lessons and enjoy himself. Guglielmo Marconi studied at the universities of Bologna and Padua, and when only 15 years old, on his father's estate near Bologna, Italy, plunged enthusiastically into the dreamlands of electricity. In the course of the next few years he headed straight for one of its great mysteries, the so-called Hertzian waves, or electrical impulses which could travel through air without the use of a wire. In 1895, when he was only 20 years old, his advanced knowledge on this obscure subject inspired him with the theory that these waves could be sent out and received at will, and in that year he had constructed the first wireless apparatus, whose efficiency astonished even his enthusiasm.

Wireless telegraphy under the masterful hand of Guglielmo Marconi sprang into commercial success in a remarkably short space of time. Prior to 1895, electromagnetic waves had been discovered, and men of many countries had experimented with them, but it remained for Marconi to see that these waves could be harnessed and made the servant of man, that they could be made to transmit intelligence from ship to shore and from one continent to another.

The waves or vibrations that make wireless telegraphy possible are in many respects similar to those of light. They travel at the same tremendous speed of 186,330 miles a second. There are several ways of producing these waves, but the one in common use is called the spark method. Briefly, it is this: An induction coil or high-tension transformer is connected to an electric-current supply so as to produce a spark across an air space. By opening or closing an ordinary telegraph key the operator causes a spark of longer or shorter duration to jump across the air space. This spark produces the vibrations by virtue of its oscillatory character. In other words, it acts similarly to a straight spring drawn back and suddenly released. It vibrates to and fro until its energy is exhausted and the rate at which it vibrates is determined by its length. By varying the rate of vibration longer or shorter waves may be produced. By means of a device, called the oscillation transformer, the vibrations are transferred from the primary circuit to the aerial or masthead wire, always conspicuous at any wireless-telegraph station, thus performing the same function relative to the spark-gap circuit that a radiator does to a steam-heating boiler.

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Guglielmo Marconi

That which is called "tuning" has to do with the adjustment of the wave length of the aerial wire to that of the closed circuit. In this manner a receiving station may be tuned to a transmitting station or, in other words, the instruments of the former so adjusted that they will be more sensitive to the waves from the latter than to those from other stations.

In the receiving system the same aerial wire and a smaller oscillation transformer are used, but in lieu of

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the spark gap we have the detector. This detector may consist of a special form of glow lamp, called an oscillation valve, or of a mineral or crystal such as silicon or carborundum, or other devices. However constructed, the various detectors serve the purpose of causing an intermittent current to flow through the operator's telephone receivers, thus producing audible dots and dashes, corresponding to the shorter or longer duration of the impulses sent out by the transmitting station. This brief account describes with fair accuracy the commercial, tuned wireless system of today.

At the present time there may be found stations a thousand miles up the Amazon River working 500 miles over land through the virgin forest, and huge commercial stations flashing thousands of words daily across the broad Atlantic, and yet the art is still in its infancy. Mr. Marconi, ever looking for new worlds to conquer, and confident in his ability, gained by years of hard work and painstaking experiment, is about to start the work of erecting 11 huge stations that will completely encircle the world.

There is something fascinating and inspiring about the pioneer work of any great achievement, and the writer feels that he has been honored in having a part in the early development in the United States of so important an art as that of wireless telegraphy. It has been particularly pleasant to have been engaged in this work as one of Mr. Marconi's engineers.

THE AEROPLANE

By ALBERT F. ZAHM, M.E., Ph.D.

Chairman of the Aerodynamic Committee of the Aero Club of America, and Leading American Authority on the Scientific Side of Aviation

THE aeroplane is the invention of the nineteenth century, and the fruition of the twentieth.

Its essential features are mainly of English origin. In 1909 and 1910, Sir George Cayley, the father of the aerial glider, published accounts of his models which coasted down hill slopes in good balance, fore and aft and laterally. He determined the power expended by gravity in such flights, and estimated the weight of motor required for dynamic flight.

In 1842, Samuel Henson patented a monoplane having all the mechanical features essential to successful flight, a motor, screw propellers, wheeled chassis, trussed wings of sufficient curvature covered above and below, horizontal and vertical rudder, Voisin-like vertical keel for inherent lateral stability. Four years later, his colleague, Stringfellow, built a steam-driven monoplane which ran down a stretched wire, and darted off into the air "in as fair a flight as it was possible to make, to a distance of about 40 yards." In 1868, he built a triplane model driven by twin screws actuated by a steam engine inclosed in a streamline body. Vertical posts and diagonal stay wires, now so common, were used in the trussing.

The aeroplane glider with superposed plane surfaces was patented in England by Wenham in 1866, and with superposed concave surfaces, by Phillips in 1884. Phillips at that date had determined, by use of a wind tunnel, the value of various favorable concave forms of wings very like some of the best in use today.

The present three-torque system of control, comprising a vertical rudder, a horizontal rudder, and a pair of ailerons operable by hand or automatically, was given to the world by Boulton of England, in 1868. Systems of torsional wings together with vertical

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and horizontal rudders for controlling flight were publicly described by Ader in France, and the present writer in 1893. Skids for landing were shown on Ader's machine at about the same date. Floats for starting from water were used by Kress, of Vienna, in 1898. Patent specifications for a complete hydro-aeroplane with two floats and the three-torque system of control were drawn by Mattullath, of New York, in 1899; the claims being allowed subsequently.

Before the close of the nineteenth century, the gasoline engine had been proposed for aeroplane propulsion, and several were actually constructed for that purpose. In 1898, Balzer, of New York, undertook to build for Langley an air-cooled five-cylinder rotatory gasoline engine of 12 horsepower, weighing 100 pounds. From this as a start, Manley built for Langley a radial five-cylinder fixed gasoline engine of 50 horsepower, weighing 200 pounds. This was the first motor in history adequate to propel a passenger aeroplane in prolonged flight. It was designed in 1900 and completed in 1907, after experiments with a quarter-size model.

Having traced the origin—mainly English—of the chief important features of the aeroplane, we may next trace the progress in utilizing them.

The passenger gliding machine was first successfully used by Lilienthal, of Germany, then by Pilcher, of Glasgow, and by Chanute and Herring, of Chicago, who perfected its trussing to the modern form of concave biplane. These were all balanced by the rider shifting his weight as he hung beneath the surface in flight. Subsequently the Wright brothers used a biplane glider, and Professor Montgomery a monoplane glider, in which they made successful flights by using the three-torque system of control, previously invented by others. The ultimate aim of the human glider was to achieve soaring flight; but this has not yet been satisfactorily accomplished.

As to the first human power-flights, Ader is reported to have flown 150 feet in 1890, in a wheel-mounted monoplane driven by a steam engine actuating twin-screws, and Maxim, three years later, rose from a track in a steam-driven multiplane, weighing 3.5 tons and lifting more than a ton of extra load. Neither machine was suitably proportioned for stable and steady flight.

On May 6, 1896, Langley launched a steam monoplane model which flew over 3,000 feet with good inherent stability. On August 8, 1903, he launched a gasoline model monoplane which flew with good stability and ample reserve power for a voyage of many miles. It was the first successful gasoline aeroplane in history. On September 7, 1903, Langley launched the first gasoline passenger aeroplane of adequate stability and power for prolonged flight.

On December 17, 1903, the Wright brothers successfully launched a gasoline-driven aeroplane, which carried a passenger 59 seconds and landed safely. Three short flights were made that day. These famous trials satisfied the witnesses and many others that the aeroplane "had come to stay." Their aeroplane was controlled by an embryo and dangerous three-torque system, in which the vertical rudder was compelled to turn in proportion to the warping of the wings. The independent working of the wings and rudder system was practically introduced in subsequent years by the Wrights and by Montgomery, though previously invented and patented by others.

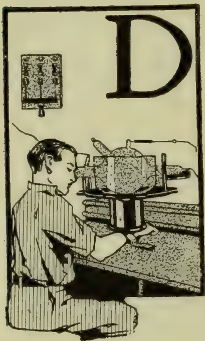
In the winter of 1911, Mr. Curtiss made the first successful flights from water in a hydro-aeroplane, thus adding a new and most valuable realm to the dominion of aviation.

We have thus briefly sketched the growth of this wonderful vehicle of the air from the time of its first inventors, scientist Cayley and engineer Henson, through its many radical improvements to the present day. It is truly a century-long creation, still in the experimental state, and far from commercially practicable. But though still an "enfant terrible," the aeroplane has achieved excellent records. It has attained a speed of 104 miles an hour in a closed circuit, has flown nearly 14,000 feet high, and has carried 13 passengers at once, their weight aggregating 1,440 pounds. It has flown through storm clouds, over mountains, seas and continents. It has voyaged by compass over inhospitable routes, from city to city, faster than the eagle or the railway locomotive. When finally perfected sufficiently for regular transportation, who will be called its inventor, and what will be its rank among the marvelous mechanical triumphs of human genius?

THE X-RAY

By ROBERT WILLIAMS WOOD

Professor of Experimental Physics, Johns Hopkins; Honorary Fellow of the Royal Microscopical Society; Fellow of the London Physical Society; Investigator of X-Rays at Their First Development, in Professor Röntgen's Laboratory in Berlin, and the First American to Take X-Ray Photographs



DISCOVERY of the X-rays resulted from the accidental observation made by Prof. Wilhelm Conrad Röntgen, of the University of Würzburg, that certain crystals, in the vicinity of a vacuum tube with which he was experimenting, glowed with a phosphorescent light, even when opaque substances were interposed between the tube and the shining crystals. Further experimenting showed that the tube was giving off a radiation, which though quite invisible to the eye, had the power of affecting photographic plates, and passed through flesh and bone, metal plates, blocks of wood, and practically all opaque substances, almost as readily as light passes through a sheet of glass.

This remarkable and epoch-making discovery was announced to the world in a paper of perhaps a dozen pages, published in the proceedings of the Würzburg Academy, a journal rarely seen or read outside of Germany, and not occupying a conspicuous spot in the reading rooms even in that country. It was more than a year before it was republished in the "Annalen der Physik," one of the three leading physical journals of the world.

Prof. R. W. Wood

As it happened, I was engaged in graduate study at the University of Berlin at the time the discovery was made, and one morning, as I passed through the laboratory, one of the junior professors called out to me, "Oh, come in here and see the pictures; they are most extraordinary, and were made with a new kind of ray which Röntgen has discovered." Together we went into one of the smaller laboratories, where, hanging on the wall was a row of photographs, such as we are now familiar with, but which at the time were perfectly startling. Pinned up beside them was a copy of the short paper to which I have referred, which explained how the pictures of the bones in the hand, and the coins in a purse had been made.

We all commenced experimenting at once. Within a week the laboratory buzzed with the news that the emperor had commanded Professor Röntgen to exhibit his experiments at the palace, and that he would set up the apparatus in the Physical Institute in Berlin before taking it up to Potsdam. A week or two after this event, a second short paper was published in the same obscure journal, outlining further prop-

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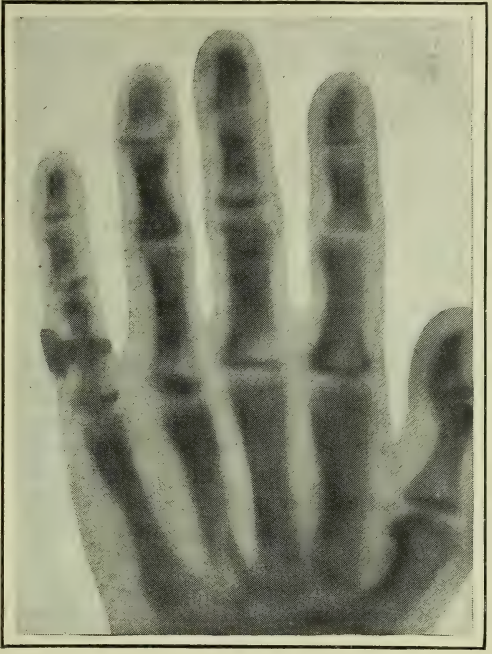
erties of the new rays, and then nothing more, for there appeared to be nothing more! So much for the discovery of the rays.

It is indeed a noteworthy fact that practically everything we know about these remarkable rays was contained in the two brief papers published by their discoverer. This happened 15 years ago, and it is only within the last year or two that any new matter of importance concerning them has been contributed to the scientific journals. As to their nature we are still somewhat in the dark, though there appears to be a good deal of evidence that they are waves in the ether similar to light waves, only very much shorter. They are generated in a glass bulb from which the air has been exhausted, provided with two electrodes which are joined to the terminals of a powerful induction coil. From the cathode terminal shoot out, with a velocity nearly equal to that of light, electrical corpuscles which, when they strike the platinum plate or anticathode, make splashes in the ether which radiate outward from the surface of the plate as X-rays.

If I am asked why they constitute one of the seven wonders of the modern world, I am afraid that I shall not be able to give a wholly satisfactory answer, for as a matter of fact, they are not nearly as wonderful as light, for the simple reason that they have fewer properties.

The X-rays are wonderful to the majority of us simply because "they photograph our bones," but this does not make them wonderful to the physicist. If we had no bones would the X-rays have received such a heavy vote? They are neither refracted nor reflected and can form images of objects only as a small candle casts a shadow on the wall, and they have few or none of the other remarkable properties of light. They do not, however, exist in nature, and this, to my mind, is what entitles them to a high place among the modern wonders. Light, heat, electricity, and even the cathode rays exist in nature, but no trace has ever been found of X-rays generated by cosmic forces. They issue only from the man-made vacuum tube; they may be said to have been created by man out of nothing, for are they not generated in a vacuum?



First X-Ray Picture Received in the United States. Dr. Wood's Hand Taken in Röntgen's Laboratory in Berlin

They have, however, one property which makes them wonderful to the physicist, namely, their ability to pass through thick plates of metal. All other forms of radiant energy in the ether, electric waves, heat waves and light waves are stopped by even very thin films of metal. True, light is able to struggle through the thinnest gold leaf, but the X-ray will pass through a slab of aluminum an inch thick. This is, I think, their most wonderful property, and is much more startling than their ability to pass through leather, wood, brick and stone, for these are opaque to light more as a result of their structure and accidental peculiarities, than of their inherent atomic structure, while the flesh of animals is quite transparent to light, though to a much less degree than to X-rays.

ANTISEPTICS AND ANTITOXINS

By E. E. HYDE, M. D.

Of the Journal of The American Medical Association

"When man learnt how to protect himself from the wild beasts," says a French writer, "he made the first step in civilization. Today man is learning how to defend himself from the microbes —a step of equal importance. A day will come when in Berlin, in London, in Paris, man will not die of diphtheria, of typhoid, of scarlet fever, of cholera, or of tuberculosis, any more than he dies in these cities today from the venom of snakes or from the fangs of wolves."

WHEN by patient experiment the germ theory was proved true, the key had been found which was to release the South from the thraldom of yellow-fever quarantine which yearly paralyzed its commerce; to free our army from the bondage of diseases which slew more soldiers than did bullets, and to unlock the barrier that held Atlantic and Pacific apart at the Isthmus of Panama.

Although the communicability of many diseases has been recognized from earliest history, it was not until about 1860 that Pasteur in his garret laboratory proved the dependence of fermentation, putrefaction and decay on the presence of minute organisms. Up to this time, as Velpeau remarked, "a pin-prick was a door for death." Almost all surgical wounds suppurated, and the suppuration, which no one could explain or prevent, was so often fatal that a conscientious surgeon advised his pupils to think ten times before undertaking an apparently necessary operation.

Lister, pondering over Pasteur's discovery, conceived the idea that if microbes could be killed or excluded from the field of operation, the mortality and suffering from surgery might be reduced. Thus was antisepsis introduced to surgery. Whereas the death rate in compound fracture was two out of three before the days of antisepsis, today it is less than one in fifty; and, whereas in the old days operation was followed as a rule by rotting sores, lockjaw, gangrene, and by death in an appalling proportion of cases, today with antisepsis the surgeon may open almost any cavity of the body, and the wounds will heal in almost every case without a drop of pus. Hospital gangrene, erysipelas and blood poisoning, once the scourges of hospitals and army camps, are now almost unknown after operation.

Dr. E. E. Hyde

A most spectacular example of the transformation of the practice of medicine is the solution of the yellow-fever problem, saving millions of dollars in southern commerce and eliminating the costly and often brutal quarantine. A Havana physician, Carlos Finlay, had stubbornly maintained that the germ of this disease was communicated to man only by the bite of mosquitoes. To prove this, during the American occupation of Cuba, the Yellow Fever Commission, composed of Drs. Walter Reed, James Carroll, Jesse W. Lazear, and Aristides Agramonte compared the results of definite contact with yellow-fever patients' clothes and discharges with those of bites by mosquitoes which had previously bitten yellow-fever patients. Volunteers submitted themselves to the experiments. No one contracted the disease except from the bite of a mosquito. This heroic test formed the basis for the new method of dealing with the disease, and it has been almost abolished.

The germ theory has enabled us to establish two lines of defense against disease, one inside and the

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other outside the body. Our first effort is naturally by cleanliness and care to avoid admitting these tiny enemies in such numbers that they can carry the body's citadel. Suppose, however, that the sentries have been unequal to their duty or the portals too numerous to be guarded; must the day be lost? By no means; where we cannot absolutely prevent infection we can increase the body's resistance to disease.

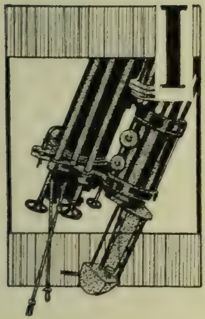
It seems that the animal body tends to cure a germ disease by creating a substance antagonistic to the germs. It was most natural, therefore, to attempt not only to increase this substance and thereby hasten recovery, but also to cause an artificial immunity in a person who might later be exposed to the disease. To take a concrete instance: Typhoid is caused in most cases by the drinking of water or milk contaminated with discharges from typhoid patients. Therefore, the first means rationally to be adopted against it is cleanliness in regard to food and drink. It is difficult, however, under some circumstances, to guard all avenues of possible infection. Soldiers on a campaign, for instance, are exposed to almost greater dangers from uncleanliness than from bullets; thousands in our army were sick and hundreds died from typhoid during the Spanish-American war. That was before the days of antityphoid vaccination. About a year ago, under conditions similar except that the men had been vaccinated against typhoid, army maneuvers were held in Texas. Two men contracted typhoid; none died.

"It is in the power of man," said the great Pasteur, "to make all parasitic diseases disappear from the earth." That prophetic utterance is in process of fulfillment; and greatly privileged are they to whom it has been granted to speed the coming of a better day, and to delve into the deep secrets of God's wonderful world, to find out laws that He created before He made man himself, and to write them large that the world may joyfully obey.

SPECTRUM ANALYSIS

By DAVID TODD, A. M., Ph. D

Fellow Royal Society of Arts, Professor of Astronomy, Amherst College



IF the wireless is a wonder-worker through the ear, no less is the spectroscope to the eye: by waves in the same ether both instruments become operant, and convey their message to us.

Although not so widely practical as the wireless, nevertheless the spectroscope is really more wonderful; for the wireless only receives the wave impulse and transmits the same unmodified. But the spectroscope has the marvelous power of classifying a confused jumble of light waves into orderly sequence, so as to signify what the original source of the light is, and what conditions it encounters in passing to the eye.

Prof. David Todd

Newton was the first to philosophize on the effect a glass wedge or prism has upon a beam of light sent through it: not only is the beam changed in its direction, but the prism transforms the seemingly simple white sunlight into a marvelously beautiful rainbow band, or ribbon of colors, to which Newton gave the name "spectrum." White sunlight, then, is not the simple thing it appears, but is compounded of all the colors of the

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rainbow. Basic as this discovery was, however, it remained for Fraunhofer, a century and a half later, to follow it up. What he discovered was this: running across the colors of the solar spectrum at irregular intervals are dark, parallel, colorless bands of varying breadth, the "Fraunhofer lines" as they have ever since been known; and he was the first to chart their position accurately.

Nearly half a century later, Kirchhoff succeeded in showing that their number and intensity, but more especially their position in the spectrum, were what really counted; so that if a substance in the form of vapor were concerned in producing light, its presence could be infallibly recognized by its particular spectral lines. Another marvel is that such excessively minute particles of elementary substances are detectible; one fifty-thousandth of a milligram of calcium, and even one fourteen-millionth of a milligram of sodium [1 milligram=0.0154 grains], being recognizable in the spectrum of a Bunsen flame, in which they are volatilized. Bunsen and Kirchhoff together formulated the principle that it matters not whether light examined by means of the spectroscope emanates directly from a glowing gas, or, coming from some extraneous source, simply passes through that gas; the lines characteristic to the substance will be in exactly the same position in the spectrum. By this great discovery spectrum analysis became a science.

The spectroscope is an engine most delicate and at the same time most powerful for research in chemistry, biology, meteorology, physics and astronomy. Many new chemical elements have been found, a research in which Ramsay has led. The vibratory motion of the molecule, and the basic relation of matter to the luminiferous ether have been investigated. The spectroscope has helped in a study of the circulatory functions in the living plant and animal. Industrial processes, too, have been greatly benefited, as the introduction of important improvements in manufacturing steel.

But the greatest wonder is bringing the stars to us so that we know what they are made of. So incalculably far away that even in the largest telescopes they show only as the tiniest points, we nevertheless find out with absolute certainty just what elements are the sources of their distant light.

Sir William Huggins was quick to see that mere distance of the light source made no difference in the character of the spectrum; and he first examined a star's spectrum half a century ago. All the fixed stars are shown to be bodies of exceedingly high temperature, and self-luminous like our sun. Scattered everywhere throughout the universe, too, are the same elements that we know on earth. The absolute temperature of the sun and numerous stars has been ascertained. Ultimately, the stars must yield their relative ages to the spectroscope. So, too, the physical constitution and life history of the nebulæ are revealed; and even the wizard comets, though freaky in their manifestation, are found to contain well-known elements.

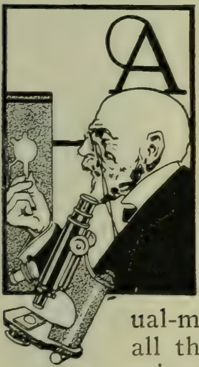
But another fundamental principle set forth by Doppler has been even more fruitful: that the spectral lines of a body radiating light are fixed in position only when that body is at rest with reference to the earth. If moving away from us, its lines are shifted slightly red-ward in the spectrum; if coming toward us, violet-ward. Elaboration of this simple principle has led to an astounding expansion of research in astro-physics, known as "radio-velocity work," and we find the cosmos everywhere alive with motion, whose direction and amount for all the brighter heavenly bodies the astronomer has already ascertained.

Because the two members of a very close double star are periodically moving toward or from us, we find, from the doubling of their spectral lines, how long it takes them to revolve round each other, although no telescope is powerful enough to reveal the components; because the spectroscope shows that stars in the general neighborhood of Sirius are going away from the sun, while those in the opposite region of the sky, near Lyra, are coming toward us, we are able to ascertain anew the direction of interstellar drift of the sun with his planetary family, and that the speed of this motion is about 12 miles per second. Because in its yearly orbit round the sun our earth is at one season going directly toward a certain star, and six months later directly away from it, the spectroscope fixes the rate of that motion, thus giving the exact size of the orbit, and so the sun's distance, or the unit of cosmic measure. In such ways the science of the stars has been revolutionized by the spectroscope and the whole universe becomes the familiar haunt of the astronomer, who tells us that outermost space is filled with substances precisely like those of which our earth is composed. Ultimately, too, the spectroscope will no doubt afford the last word on that greatest of all problems in physical science, the order of the cosmos, or the origin and distribution of the unnumbered millions of stars throughout the celestial spaces.

RADIUM

By HERBERT N. McCOY, B. S., Ph. D.

Professor of Chemistry, University of Chicago; Researcher and Author on Radioactivity



AMONG scientists, it is very generally conceded that the discovery of radium gave to the world one of its most interesting and unique riddles. After all the "cranks," as well as geniuses, had failed to produce a perpetual-motion machine; after all the alchemists and their scientific successors, the chemists, had failed to change any single chemical element into another, and the world had settled down to the belief in the impossibility of achieving either of these aims, the discovery of the phenomena of radioactivity seemed to show the fallacy of the conclusion in both cases.

The discovery of radium was the logical result of the attempt of Becquerel, in 1906, to find a chemical substance which would produce X-rays. This famous French scientist seemed to have succeeded when he found that all compounds of the rather rare element uranium gave rays that, like X-rays, could penetrate light-proof screens and act upon photographic plates. A very remarkable fact was then discovered: the ores of uranium were far more active than their uranium content would lead one to expect. This discovery led Mme. Curie, the brilliant young wife of Professor Curie, Becquerel's colleague, to search for other active substances than uranium in such minerals. After two or three years of most difficult work, from a ton of ore as much radium as could be heaped upon a dime was obtained, in the form of pure radium chloride, a white crystalline substance over a million times as active as an equal weight of uranium. A bit of this radium no larger than a pin head could produce a photograph in a minute or two. The radium itself glowed faintly in the dark and caused certain minerals, as zinc blende or diamonds, brought near it to glow quite brilliantly. Viewed with a magnifying glass, the glow of the zinc blende is seen to be due to numer-

Prof. H. N. McCoy

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ous distinct sparks or scintillations, each visible for but a moment.

Not only light, but heat also is produced. At first it was thought that this heat was produced continuously and with no apparent diminution or loss of radium as time went on. This led to the statement that radium was a source of perpetual energy. We now know that the rate of heat production is slowly diminishing and that a given quantity of radium can produce only a limited total amount of heat energy, which is, however, about a million times as great as that formed by the burning of an equal weight of coal. The chemical and physiological activities of radium are also matters of great interest and importance.

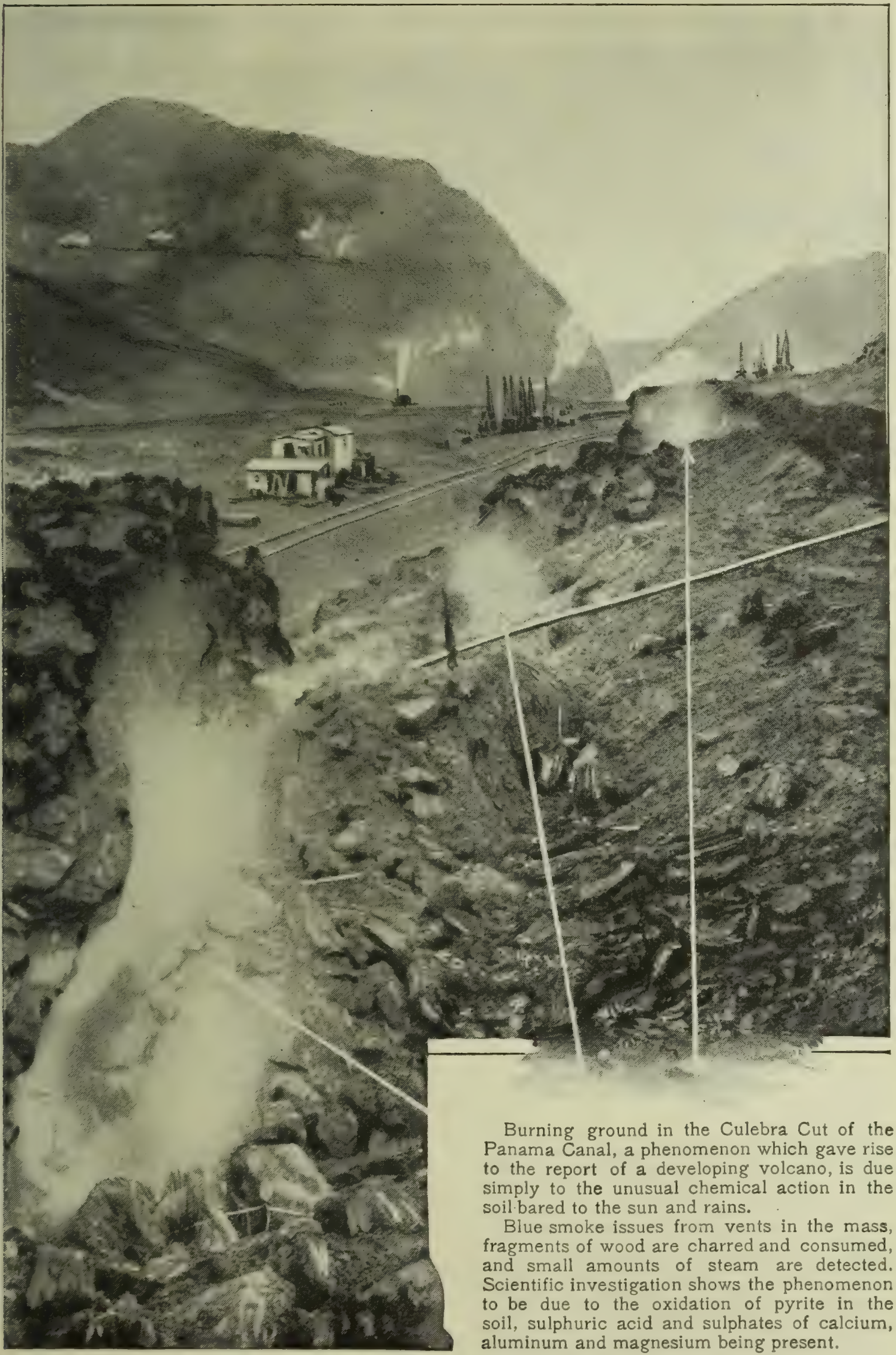
The rays or radiations of radium are of three sorts, the "alpha," the "beta" and the "gamma" rays. The latter are nearly identical with X-rays, the beta rays are electrons or particles of negative electricity shot out at velocities of over 100,000 miles a second. The alpha rays are material particles, also shot out at nearly as great velocities as the beta rays. The identification of the alpha rays as atoms of the gaseous element helium was one of the great discoveries that went far to explain the mystery of radium. In addition to helium, radium also produces continuously another gas, the emanation, which like radium itself is intensely radioactive. Now both helium and the emanation are material substances, each of which is an element, and the change of radium into these gases is, from the chemical standpoint, quite as marvelous as that of silver into gold would be. But this is only a part of the story: radium itself is being continuously produced by the element uranium, and the final product of the emanation is very probably the metallic element lead.

Any adequate theory in explanation of the phenomena of radioactivity must naturally be based on an assumption regarding the nature of matter and the structure of the atoms. It has long been evident that we can not consider the atoms to be solid, indivisible particles. It is now thought that an atom is made up of electrons and helium particles moving in concentric circles with enormous velocities, and that the atoms of one element differ from those of another element only in the number and arrangement of their component parts. Such an atomic system would usually be stable, as in case of elements not radioactive. But if it were not wholly stable, it would in time break up and in so doing throw out electrons or helium atoms with high velocities.

According to this theory, the energy of radium has existed in the atom as the energy of its rapidly revolving parts, but becomes apparent only when the atom disintegrates. Radium seemed to have a constant activity merely because it was changing very slowly—about .04 per cent a year: it is, therefore, not a source of perpetual energy. The change of one radioactive element into another and into helium is accounted for in the following simple fashion: the larger, heavier parent atom disintegrates, shooting out an electron, or an alpha ray, which is an atom of helium, and leaving a smaller atom of a new element, which becomes in the course of time unstable and in its turn disintegrates, this process continuing until a stable atom of lead is finally left.

It is now proved beyond doubt that radioactive change is spontaneous and cannot be induced or influenced by any human agency; the chemist is still unable to produce the transmutation of a single element into any other.

CULEBRA "VOLCANO" CHEMICAL ACTION IN SOIL



Burning ground in the Culebra Cut of the Panama Canal, a phenomenon which gave rise to the report of a developing volcano, is due simply to the unusual chemical action in the soil bared to the sun and rains.

Blue smoke issues from vents in the mass, fragments of wood are charred and consumed, and small amounts of steam are detected. Scientific investigation shows the phenomenon to be due to the oxidation of pyrite in the soil, sulphuric acid and sulphates of calcium, aluminum and magnesium being present.

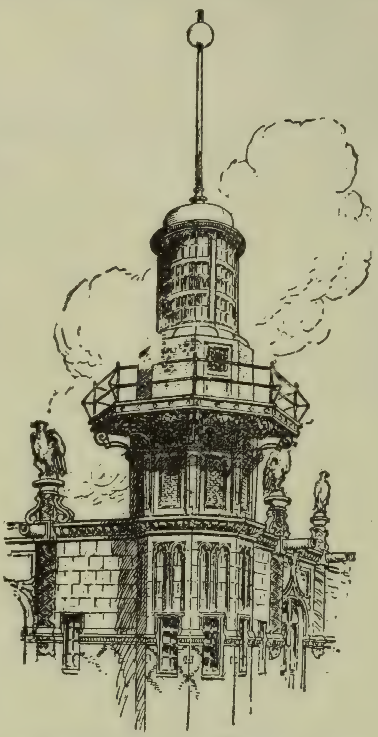
LIGHTHOUSE TOWER AS "TITANIC" MEMORIAL

The new Sailors' Home Building, at the corner of South Street and Coenties Slip, New York, will have a lighthouse tower designed as a memorial to the "Titanic." This tower, according to the Nautical Gazette, will be identical with the accepted form of lighthouse, with stairs in the rear, a lantern gallery, and a fixed green light which will shine out over the harbor and be visible to all the lower anchorage down through The Narrows to Sandy Hook. The government has given permission for the use of the green light, and, as this color is not used by any lighthouse on the coast, the memorial-tower lantern will be a particularly distinctive one.

CONCRETE-BLOCK OUTFIT FOR BOYS

Nothing delights the average boy more than the building of something real, whether it be a playhouse, a boat, a cart, or any other object which a wide-awake boy can fashion with varying degrees of success. No material, however, is more suited to arouse the interest of the boy and convert his desire to "do things" into practical, tangible results than concrete, and, provided with an outfit similar to the one dealt with in this article, he will be able to plan and build numberless small structures, such as miniature houses, dog kennels, etc., and also construct such articles as retainers for garbage cans, match safes, flower boxes and many other useful things.

The outfit for making concrete blocks consists of a frame, 2 by 2 by 2 in. or 2 by 2 by 4 in., with plates sufficient to make four different block faces for the full-sized blocks, and eight faces for the smaller blocks; an adjustable mold for making copings, cornices, door and window sills, and any other special blocks up to 2 by 2½ by 10½ in., together with cores for making the blocks hollow. Triangle strips are provided for making bevel edges, and there is a full equipment of tools for keeping the molds in good condition, as well as complete instructions for making concrete, tamping and coring the blocks, setting up the molds, and making special blocks and columns.



A Memorial to the "Titanic:" the Lighthouse Tower of the New Sailors' Home in New York

SEA CRABS AS TRAVELERS

The propensity of edible sea crabs to travel has been undergoing interesting tests in England. Between July and September, 1910, according to a report of the Eastern Sea Fisheries Committee of London, Eng., nearly 2,000 crabs were captured, and, after being labeled, were again set free along the Norfolk and Lincolnshire coasts. These crabs had cast their shells a short time before capture and new ones were in the process of hardening when they were labeled. The crabs were returned to the sea at varying distances from the shore; rewards were offered for their return when captured, and up to the present time about 21 per cent have been turned in to the commission by fishermen, and full data tabulated. One of the crabs had traveled a distance of 98 miles, several had journeyed from 40 to 50 miles, 52 were captured within one mile of their first home, and 300 had traveled only three or four miles.

Open-Air School for Weak Children Conducted in a London Bandstand

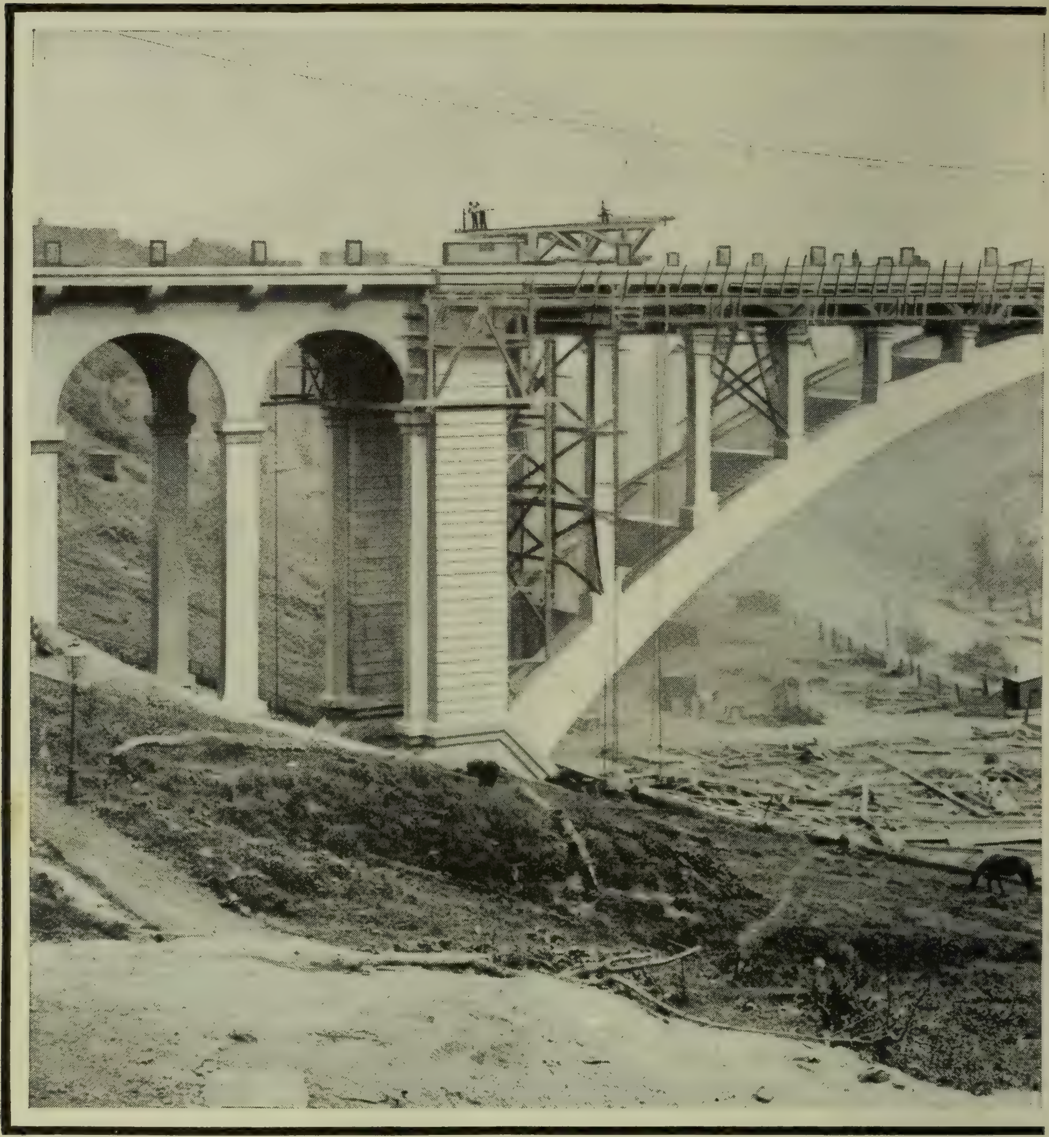
OPEN-AIR SCHOOL IN BANDSTAND

One of the bandstands in Regents Park, London, is now being used as an open-air school for weak children, through the efforts of Dr. Sutherland, of the Marylebone Dispensary. The children attend this school in all kinds of weather, being provided with shawls and foot covering in wet weather. The bandstand is an ideal place for such a school, and the sessions, holding during the day and on week days only, do not interfere with the use of the stand for band concerts.

¶That safety first is becoming an important factor in railroad operation is shown by the recent statistical report of one of the largest railway systems in the country, which carried, during the five years previous to December 31, 1911, 151,802,143 passengers, of which only three were killed.

ECONOMY OF GASOLINE POWER FOR TUGS

By converting the tug "Fox" from steam to gasoline-motor power, the owners of this Pacific Coast boat have succeeded in saving the wages of an engineer and have obtained a number of other advantages. It was necessary to take off the old house and then build a new bed for the engine, but the new arrangement gave much more room for quarters. The reduction in weight of power plant brought the tug about 8 in. higher out of the water, which was a decided advantage, as the absorption of water in her woodwork had carried her down 10 in. below the waterline originally planned, and more freeboard was needed for her class of work. The new engines increased her speed almost two miles an hour, and are being controlled by the pilot in the pilot house, with occasional attention from the one deck hand.

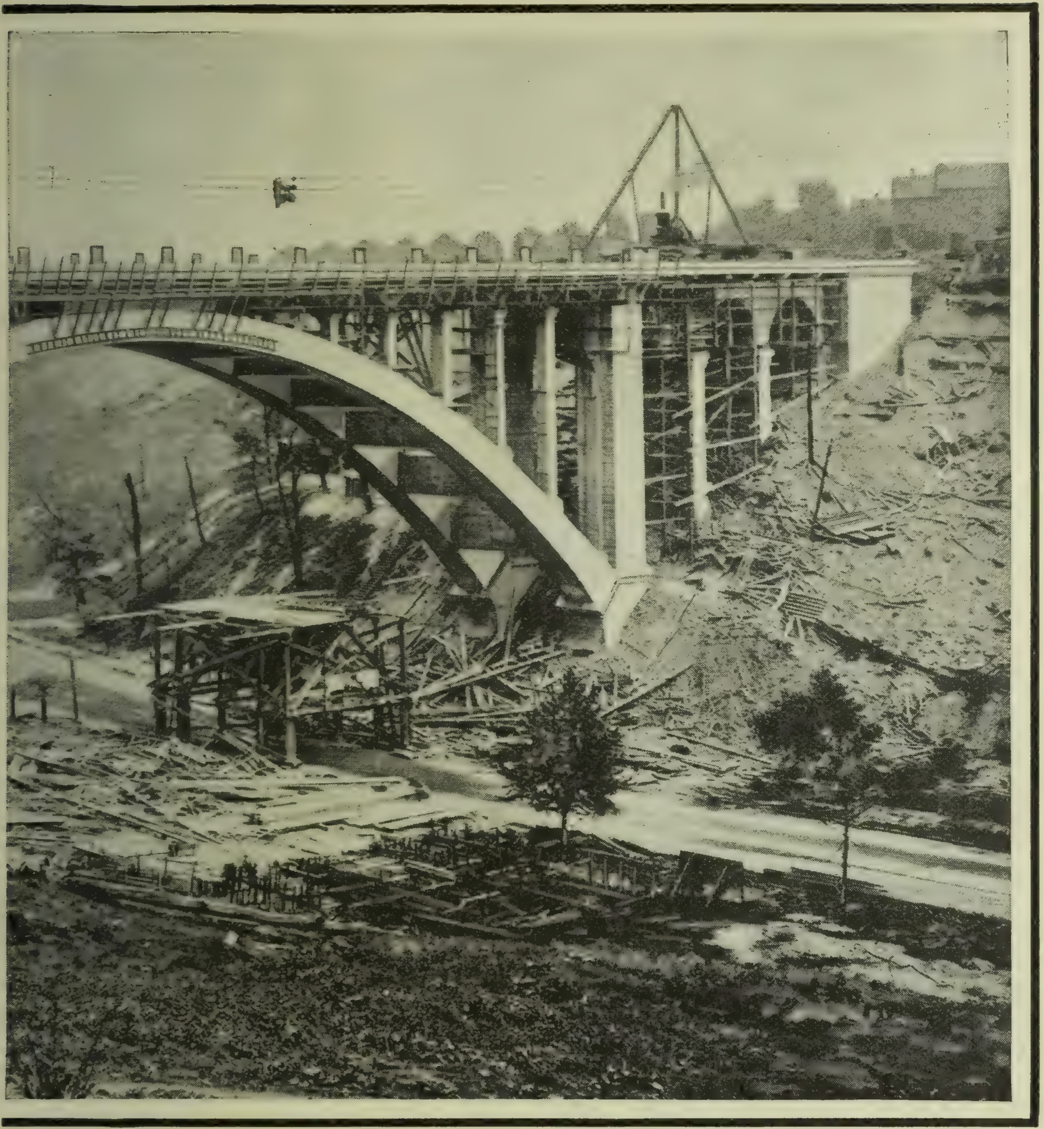


Mammoth Reinforced Concrete Arch in New Pittsburgh Bridge of

GREAT ARCH OF CONCRETE IN PITTSBURGH

The largest concrete arch in magnitude in the world, and the second largest as respects length of span, is practically completed at Pittsburgh, Pa. It forms part of the Larimer Avenue bridge over a deep ravine in the eastern residential section of the city, and measures 312 ft. clear span. In Australia, 12,000 miles away, there is a huge arch of concrete with a clear span of 317 ft.; but as it is 36 ft. wide as compared with the 50 ft. width of the Larimer Avenue bridge, the American work is by far the largest. The height of the Pittsburgh structure is 113 ft.

Overall, the bridge is 670 ft. with a roadway in the center, 30 ft. in width, flanked by sidewalks 10 ft. wide. The immense arch ribs of the main span have a rise of 67 ft. With the exception of these ribs, which are reinforced



Greater Magnitude Than Any Similar Structure in the World

with structural shapes, the entire work is of reinforced construction, medium open-hearth steel rods being used. The roadway is supported on a main arch by means of columns spaced 17 ft. apart and connected at the top by reinforced concrete girders. The main piers are of cellular or boxlike construction.

At the western end of the bridge are four approach arches and at the eastern end, three; with 30-ft. spans for all. Immediately beyond these are the abutments which are of most solid and substantial build, in U-form, filled with earth.

The roadway is paved with sheet asphalt and has a grade of $1\frac{1}{10}$ per cent. There is an ornamental bridge rail of iron, supported by panel posts of concrete, spaced 16 ft., center to center. Ornamental iron electroliers carry arc lights.

In the entire bridge there are 8,500

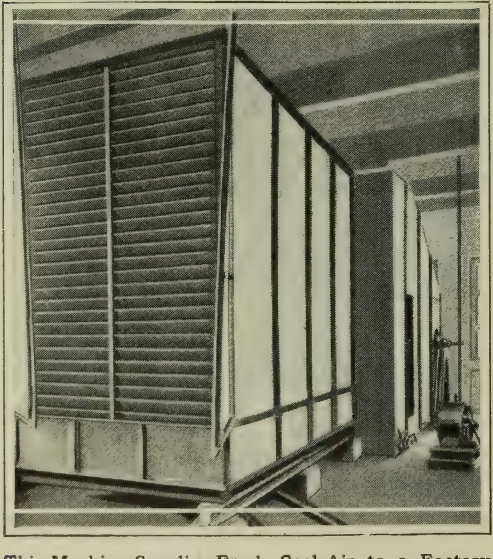
cu. yd. of concrete and 436 tons of steel. The estimated cost of the work is $140,000.

Concrete bridges are taking the place of iron and steel bridges all over the country as they are more durable, being less subject to atmospheric influences. No less than three concrete bridges are now being built in Pittsburgh by the municipality. The Larimer Avenue work is under the supervision of the Department of Public Works of Pittsburgh.

IMPROVED AIR CONDITIONS FOR FACTORY

The heating and ventilating equipment of a new factory building in Springfield, Mass., includes two air-cooling machines of the type shown in the accompanying illustration. During very hot weather a simple change of air would not be of advantage, the outside air being of such high temperature that it would offer no relief to draw it into the building. When such conditions prevail it is intended to close all windows, bring the fresh air in through two stair wells and cool this air before it enters the workrooms.

The cooling machines are of the water-spray type. The air is taken in through an opening in the pent house, enters the cooling machine, is drawn through the water spray, passes a number of baffle plates, where it loses its free moisture, continues through the fan into the stair well and passes from there through the louvers into the workrooms. After it has circulated through a workroom it leaves through the upper louvers in the center partitions and is drawn into the main stair well and exhausted.



This Machine Supplies Fresh, Cool Air to a Factory during the Hottest Weather

The water for the machine is taken from the well at a rate of about 60 gal. per minute for each machine and at a temperature of about 54 deg. F. The manufacturers guarantee that air entering at 95 deg. F. and containing 9.3 grains of moisture to the cubic foot will be cooled to 78 deg.

It is calculated that under these conditions it will be possible to keep the temperature inside the building about 9 deg. lower than the outside, changing the air four times an hour.

As this is practically the first attempt that has been made to cool large workrooms with a view to improving conditions for workmen during hot weather, it is expected that some complications may arise that will make the problem more difficult than it appears, but it is also believed these difficulties will be overcome.

REMOVING PLANT PESTS OF LOUISIANA WATERWAYS

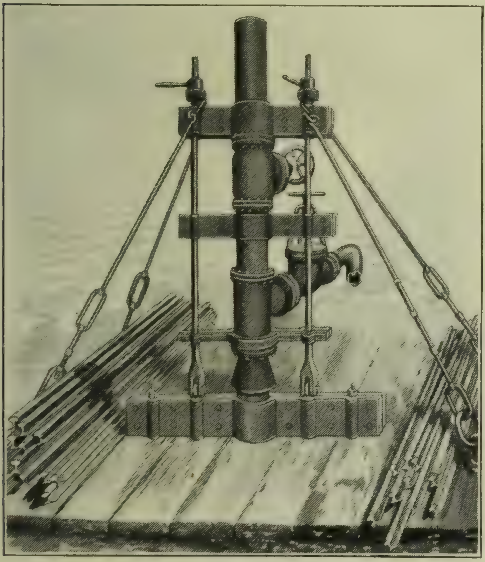
Water hyacinth, the pest of the bayous and canals of southern Louisiana, has become such an obstruction to traffic in those waterways that an organized effort is now being made to eradicate it. At the head of the movement is Lieut.-Col. Lansing H. Beach who will have the active coöperation of officials from various counties, and of local business men. Patrols will be established on each stream. The United States engineering office will do the heavy work of removing the hyacinths, either by spraying or total removal from the water, and will also remove underbrush and trees along the banks where the plant lodges and finds growth. Fixed and swinging booms also will be established, most of them under government supervision.

After a stream has been cleared the committee will appoint patrols to detach any large masses of hyacinths which may be found, so that they may float seaward. The booms also will be inspected by the patrols. It is believed a man in a skiff can patrol from 5 to 10 miles a day, and a launch patrolman from 10 to 20 miles.

THE WORLD'S GREATEST OIL WELL

A Mexican Oil Well Which Has a Capacity of 110,000 Barrels per Day

Potrero del Llano, Mexico, claims the biggest oil well in the world. It is situated near the Gulf of Mexico, about 110 miles southeast of the port of Tampico, and was struck at a depth of about 1,800 ft. When the column of oil burst forth it resisted all efforts to bring it under control, running wild for three months before the mechanical ingenuity of experts succeeded in curbing it. This was accomplished by means of a giant steel valve, made especially for the purpose. The valve, which will withstand a pressure of 2,400 lb. to the square inch, was installed under extreme difficulties, and even with such a valve upon the mouth of the well it was not deemed wise to close the flow entirely at any time. It is throttled to a daily output of about 25,000 bbl.



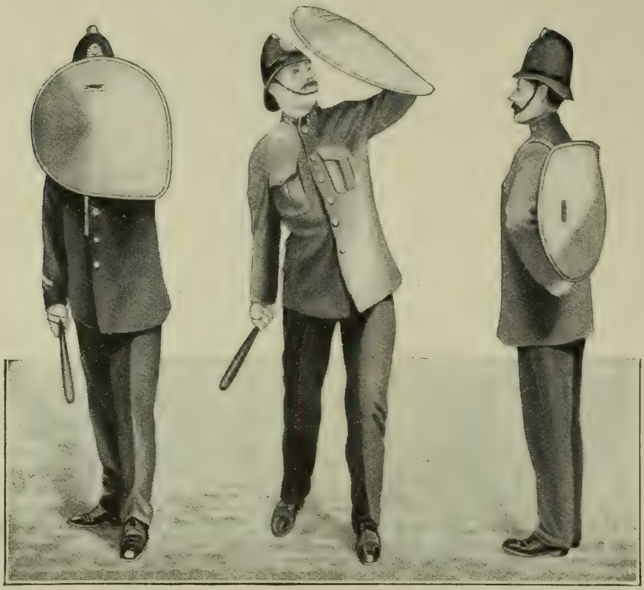
Steel Valve on the Mexican Oil Well Which Withstands Pressure of 2,400 Lb. to the Square Inch

Several months after the well was harnessed it was opened up to its full capacity to discover whether the flow had decreased. It was permitted to gush forth for 20 minutes, during which time the output was carefully measured and found to be at the rate of 110,000 bbl. per day. More than 10,000,000 bbl. of oil was lost during the period the well ran wild.

¶Final legal recognition of the aeroplane seems to have come in France, where a law has been enacted providing that a report must be made within 24 hours to the Health Department of births occurring in flying machines.

SHIELDS AS PROTECTION FOR POLICEMEN

The riots in Liverpool, Eng., last year, in which the police received many severe injuries from bombardments of broken bottles, iron fragments and brickbats thrown by the disorderly element, have resulted in the adoption by the police of that city of a shield for use in such emergencies. It is the invention of a Liverpool citizen, who acted as a special constable during the riots.


Shield in Position to Protect the Face Warding off Missiles Hurled from Roofs Method of Carrying the Shield

PROTECTING CONCRETE AGAINST FROST

A concrete reservoir, 45 ft. in diameter and 21 ft. high, partly above and partly below ground, erected in Virginia, Minn., by the Electric Power & Water Co., was successfully protected against freezing by covering the exposed part with a layer of clay, then a layer of cinders and above that a second layer of clay. When this covering was removed last spring, the tank showed no sign of injury by frost, despite the severe winter.

SULPHUR GASES DESTROYED BY NEW PROCESS

Elimination of sulphur gases from smelter fumes has been accomplished at an experimental plant in California. Its operation is based on a process originated by Prof. S. W. Young, of Leland Stanford university. The smelter fumes, at properly elevated temperature, are caused to mix thoroughly with the vapor from an oil spray. This process reduces the sulphur oxides to elementary sulphur, which, however, has to be condensed to the plastic or solid form by a reduction in temperature.

The temporary plant comprised a brick flue with a condensing chamber and a second flue leading to a smokestack. The larger flue, which receives the smelter gases directly from the roasters, has transverse panels of brick checkerwork, the openings of which are filled with broken pieces of a mixture of plaster of paris and sawdust. The sawdust burns out, leaving the plaster porous, and this furnishes a contact material to expedite the reaction between vaporized oil and sulphur oxides. The condensing chamber has a single-partition baffle wall and discharges to the second and smaller flue leading into the stack.

Before the gases are sent through, the whole apparatus is heated to a low red heat. Oil is sprayed into the hot gases near the roaster intake, and water is sprayed through the roof of the condensing chamber. It is reported that by the time the gases have reached the condensing chamber there are no appreciable quantities of the sulphur oxide. Contact with the cooling spray causes the sulphur to condense, most of it being deposited in plastic form on the floors of the condensing chamber, but considerable quantities are carried out of the smokestack in the form of the "flower of sulphur." The process is patented.

PRIMITIVE SCREWS STILL USED IN INDIA

Screws are still made in India in the primitive way, according to Eastern Engineering, there being not the slightest change from the original method. Two soft wires are wound together around a mandrel, then the wires are carefully separated, and one of them is soldered into a tube or nut, while the other is soldered to a short rod. These screws are left-hand, as the wire is wound over and over by the right hand. All the silversmiths make their screws in this way.

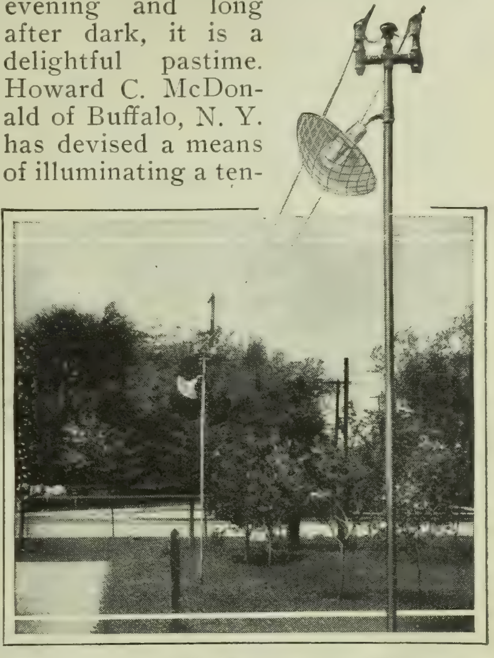
MECHANICAL PEN FOR STIPPLING

A well-known English artist and designer is here shown at work with an ingenious machine of his own invention to make the series of dots and marks in drawing and engraving called stippling. It is a mechanical pen capable of producing beautiful examples of stipple and other designs, and is run by clockwork. All he has to do is to guide the pen and use his artistic ability as a designer.

Working with a Clockwork-Driven Stippling Pen

LAWN TENNIS PLAYED AT NIGHT

Lawn tennis is a fascinating and healthful game, even when played in the heat of the day, but when it can be played out of doors in the cool of the evening and long after dark, it is a delightful pastime. Howard C. McDonald of Buffalo, N. Y. has devised a means of illuminating a tennis court so that play can be started rather than stopped at the arrival of dusk.



Lawn-Tennis Court, Showing How Light is Supplied

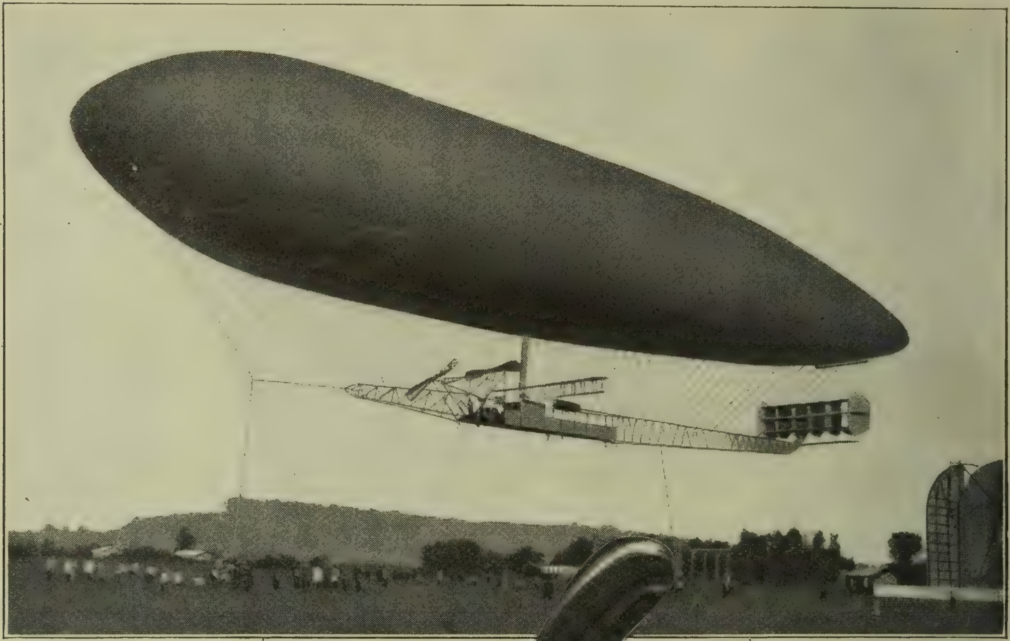
The idea of playing tennis with the use of artificial light is not a new one. The former method, described in this magazine some time ago, called for a number of incandescent lights along the four sides of the court, but no effective and economical means of lighting had been devised heretofore.

Instead of employing a great many lights and great electric power, the owner can get satisfactory results with four large incandescent lights. The lights are placed at the top of four poles, located 7 ft. back from the side lines of the courts on the sides, and directly opposite the serving line, or 18 ft. on either side of the net.

The poles are 12 ft. high and the lights are set deep in 1-ft. metal reflectors. The reflectors are covered with wire netting so that they will not be broken by the ball while in play and are tilted at an angle of 45 deg. toward the center of the court. The player thus sees only the diffused light from the reflectors instead of getting the sharp light from the bulb.

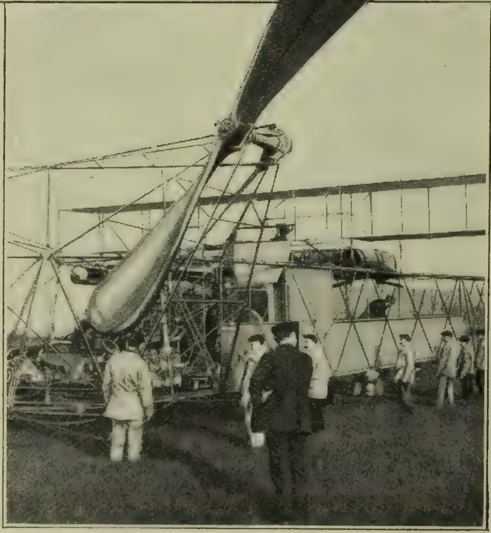
The lighting of the court is controlled by a switch from the house. The poles on which the lights are located are of 1¼-in. pipe. The wiring is carried along the sides and not across the court, from pole to pole, so that it in no way interferes with the play.

LATEST WAR DIRIGIBLE OF THE FRENCH ARMY



"Clement Bayard V," Latest French Army Dirigible

The aerial department of the French army, which has been steadily developing the dirigible balloon as well as the aeroplane, and has easily ranked France with Germany as a world power giving most consideration to the gas-lifted airship, has just added the "Clement Bayard V" to its aerial fleet. The new dirigible is 282 ft. long, has a volume of 318,000 cu. ft., and is driven by two 125-hp. motors. She has two propellers, each of which has a span of about 20 ft., and her speed is about 35 miles an hour.



Carrying Portion of the Car, Showing One of the Propellers and the Motor Arrangement

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¶The Peruvian government has announced the finding of a valuable emerald mine in that country.

INTERNATIONAL RADIUM STANDARD

A commission of scientists from all countries has been working out in Paris an international standard of radium, by means of which it will be possible in the future to exactly determine the quantity of radium contained in any preparation, and consequently also the comparative value of the various radioactive substances.

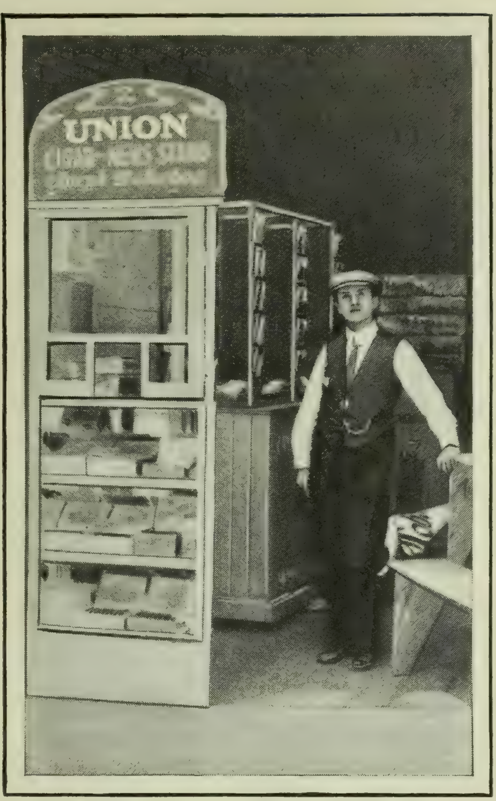
The proposal of Madame Curie, who has taken part in the deliberations, was to adopt as the international standard one which she had previously presented to the Austrian radium institute and a duplicate of which she had presented to Sir William Ramsay. This proposal was accepted.

The international standard will be kept at Paris. It consists of less than eight ten-thousandths of an ounce of pure chloride of radium, to the value of $2,640. This sum was contributed by one of the members of the commission. Secondary standards will be made and placed at the disposal of governments or scientific institutions, desirous of procuring them.

THE WORLD'S SMALLEST BUSINESS "BUILDING"

What is believed to be the smallest business "building" in the world is located at 2 Light Street, Baltimore, Md. This building, for it is a building inasmuch as a building permit was required from the city authorities before it could be erected, stands on a triangular-shaped lot, has a frontage of 2 ft. 7 in., a depth of 1 ft. 5 in., and is 6 ft. tall.

The ground upon which it stands is a remnant left when Light Street was widened following the great fire of 1904. At that time the city bought all of the lots fronting on this street, as it was then, took what land was necessary for the reconstructed street, and sold the remnants at public auction. The remnant upon which the smallest "building" stands was purchased by Joseph P. Jarboe, who, fortunately, in common with adjacent owners, enjoys the privilege of using a portion of the area way in the rear. Otherwise his "property" would be of little use to him.



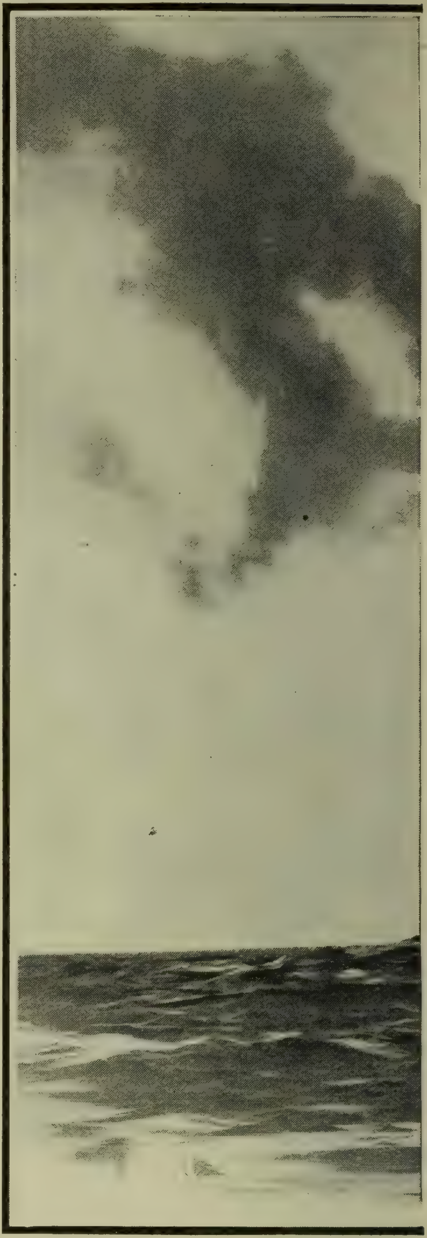
A $2\frac{7}{12}$ by $1\frac{5}{12}$-Ft. Structure, Considered as a Building Because a Building Permit was Required for Its Erection

AUTOMOBILE SALESMEN HAVE FARM-HAND AIDS

The greatest trouble of the automobile salesman whose activities take him among the farmers, is the latter's unwillingness to listen to him during the busy season, but one selling organization, at least, has overcome this difficulty in a very ingenious way. Each salesman takes along with him an able-bodied farm hand. When the farmer mutters "Too busy!" and makes a move as if to start off behind his plow, the salesman checkmates him with, "That's all right. Here's a man who'll engineer the plow while I show you the machine. We'll go for a nice little ride."

SPEED TRIALS OF THE U. S. S. "ARKANSAS"

The accompanying illustration shows the "Arkansas," the greatest American battleship yet in commission, during one of her speed trials off Rockland, Me. Despite her accident in striking a reef, she continued her speed tests, and in five of her fastest runs averaged 21½ knots (24.75 miles an hour). At no time during these runs did she draw on her reserve power.



The U. S. S. "Arkansas," the
When a

NEW CIVILIAN COURT DRESS OF BRITISH COURT

New rules on the old and the new style of court dress permitted the ordinary civilian at British court functions have just been published in a book by a court official. Both uniforms are of black velvet, but the older dress is more elaborately ornamented with steel buttons, and there are lace frills and ruffles at the neck and wrists.

Mistakes frequently arise when attempts are made to introduce some of the ornaments of the old style into the simpler form of the new. Persons in uniform sometimes come to court wearing trousers prescribed for a levee, says a writer in the London Mail. They are not always refused entree, but are occasionally permitted to pass the official censor upon promise to keep in the background. Many civilians also make the error of wearing their swords on the right-hand side.

The court dress of a private gentleman costs from $150 to $250, according to the elaboration of the steel work in the buttons and sword hilt. The black velvet coat costs about $50, the steel buttons from $10 to $50, and the black velvet breeches from $30 to $35. The white satin waistcoat required varies in price from $10 to $15 or more, while the cocked hat is a trifle more expensive. Knee and shoe buckles range from $5 to $20, and the sword from $17.50 upward.

Members of the royal household require about $1,500 worth of uniforms. They must have full dress for courts, state balls, concerts and other great ceremonies, levee dress for less formal occasions, and special evening dress of blue cloth with black velvet collar. For certain officers of the household a Windsor uniform is essential. This is an evening dress worn only at Windsor castle.

¶Cabole is a beautiful tree which grows in Africa and in the West Indies, and is said to furnish the most costly wood in the world, being quoted at about $3,500 per cubic yard.

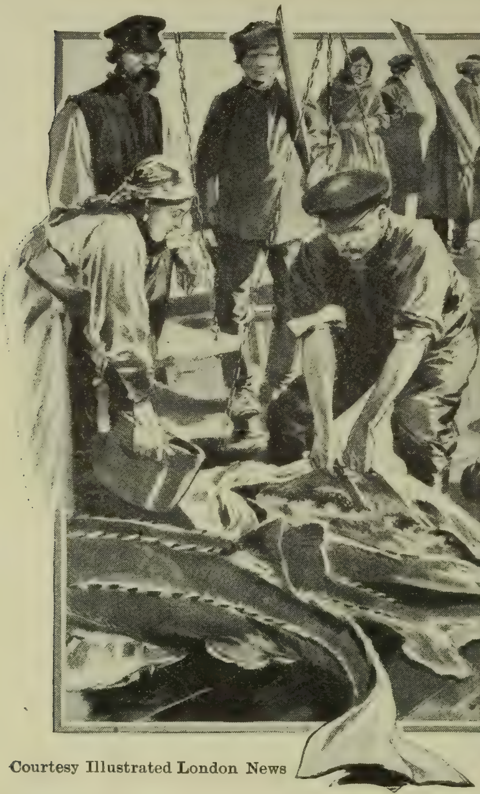
Newest and Most Powerful Battleship of the United States Navy, on Her Recent Trial Trip
Speed of 24.75 Miles was Attained without Drawing on Reserve Power

HARVESTING CAVIARE IN RUSSIA

The delicacy caviare consists of sturgeon eggs or roe, salted down. The caviare industry is most extensive in Russia, and the chief center for the sturgeon fishery in that country is Astrakhan, at the mouth of the Volga River. The sturgeon often attains a length of 24 ft. and a weight of 1,200 lb., and sometimes a third of this weight consists of roe, a single fish in many instances containing as many as 3,000,000 eggs.

The roe is taken from the fish by

slitting them up the belly on the docks or in the fish houses. Then it is separated from its adherent tissue, passed through sieves, salted down in tubs, and packed for storage or export.


Courtesy Illustrated London News

The Source of Caviare is the Sturgeon's Belly; Removing the Eggs or Roe from Sturgeon on a Fishing Wharf in Russia

Some years ago the sturgeon fishery was carried on to a considerable extent in Lake Huron and one or two other of the Great Lakes of America, but the catch of sturgeon has been steadily diminishing.

SKYSCRAPERS AS VENTILATING SHAFTS

The inrush of air that takes place when the street door to a skyscraper is opened on a cold day is an annoyance often commented on. But few persons stop to consider the cause of this phenomenon, or to note that it does not occur in warm weather or when the door to a small building is opened. This rush of air is most severe in the highest buildings, which also have the largest elevator equipment. There are always a sufficient number of openings near the top of such a building to cause the elevator shafts to act as huge ventilating flues. The difference in temperature between the air inside the building and that on the outside causes a constant pressure on the doors, the effect of which is noticed only when the doors are opened. To overcome this, two sets of doors are being installed at the entrances to most new high buildings. This is an effective remedy except when the inner and outer doors of an entrance are opened at the same time.

EFFECT OF SOLAR ECLIPSE ON WIRELESS

Interesting tests were made between the wireless stations at the Royal Dock Yard, Copenhagen, and at Blaavandshuk, Jutland, during the recent solar eclipse, to ascertain the effect of the eclipse on wireless transmission. It was shown that the transmission became more distinct and reliable as the eclipse progressed, and that it was most distinct shortly after the culmination of the eclipse. This is claimed to confirm the belief that it is the effect of the solar light upon the atmosphere which causes wireless communications to be less clear during the day than at night.

TABLE CONSTRUCTED BY BLIND WOODWORKER

In the accompanying illustration is shown a combination cabinet and art table constructed for an artist by W. L. Kohler, a blind woodworker. Every part of the table is handmade, finished in dark golden oak, and is only one of the many articles of furniture he is able to construct, though handicapped by loss of sight.

The Only Lodge Hall Located in a Modern Hotel in America

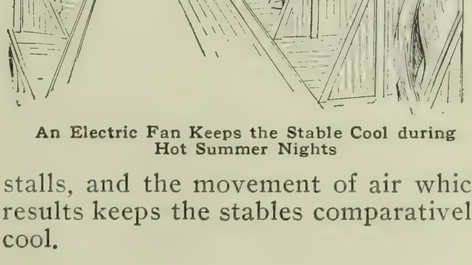
MASONIC HALL IN CHICAGO HOTEL

The beautiful Masonic Hall in the Auditorium Hotel, Chicago, is said to be the only lodge hall located within a modern hotel in the United States. It occupies the Egyptian room, formerly a banquet hall, 85 ft. long by 40 ft. wide, with a 22-ft. ceiling. The main feature of the illumination of the hall is the 21 indirect-lighting fixtures suspended from the 21 stucco panels of the ceiling. Eighteen art-glass windows presented a problem in illumination which was solved by placing indirect-lighting units behind each, at the proper angle to make the art-glass patterns become distinctly visible when the other lights are dimmed.

¶A recent test of the gates installed in a Gatun lock of the Panama Canal shows that the operating machinery could open and close the enormous structure, each half of which weighs 448 tons, in less than two minutes.

ELECTRIC FANS USED IN STABLE

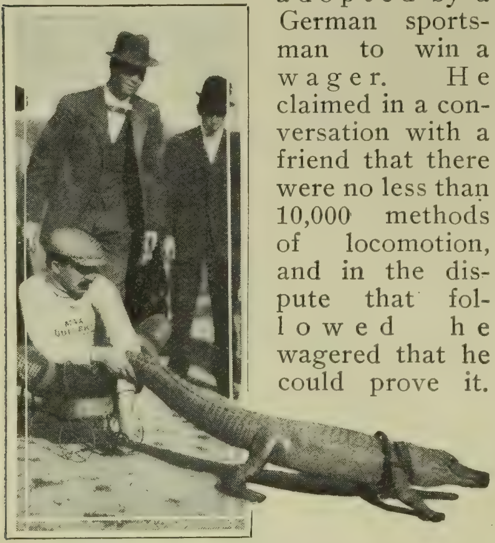
The stables in the fine modern barn of the Western News Company in Chicago have been made a paradise for horses during the warm summer months by the installation of electric fans. Oscillating fans are mounted on the wall at the ends of the passageways leading between the rows of stalls, and the movement of air which results keeps the stables comparatively cool.



An Electric Fan Keeps the Stable Cool during Hot Summer Nights

DRIVING AN ALLIGATOR

Using a child's toy wagon and allowing himself to be drawn about by an alligator, is one of the queer methods adopted by a German sportsman to win a wager. He claimed in a conversation with a friend that there were no less than 10,000 methods of locomotion, and in the dispute that followed he wagered that he could prove it.



One of 10,000 Modes of Transportation

The bet was taken up by the friend and a trip around the world was undertaken to try out all the various kinds of transportation, and incidentally to devise some new ones. This is one of the German's original stunts. It was carried out at the alligator farm at Los Angeles, Cal. As a photograph of each method of transportation is taken, there will be no question over the result of the attempt.

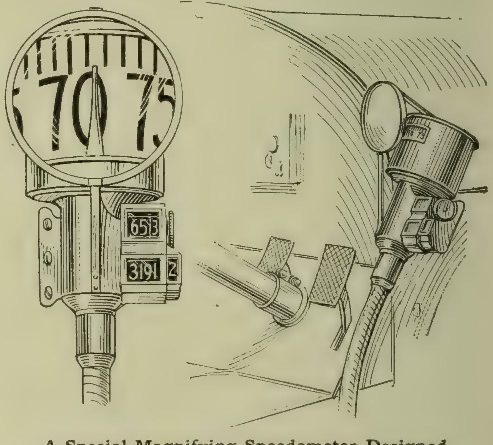
OZONIZED AIR HASTENS DRYING OF PAINT

A method of hastening the drying of freshly applied paint, especially on automobile bodies, by means of ozone, has recently been put to a test. The inventor explains that when a filler, paint or varnish dries, a chemical reaction takes place, the oil in the paint becoming oxidized and increasing in weight, which increase indicates the degree of dryness the paint has attained.

The ozone, which is an active oxidizing agent, was carried by forced draft into the drying room where it came into contact with "green" paint on the newly painted body selected for the test. Another body, having an equal amount of paint spread over the same area, was placed in a natural atmosphere. At the end of an hour the body kept in the ozonized air had gained 1.67 per cent in weight, while the other had increased only 1.13 per cent. At the end of the second hour the respective increases in weight were 3.34 per cent and 1.51 per cent; and after 15 hours the ozone-treated sample had gained 19.74 per cent, as against a total increase of 9.76 per cent for the other. The ozone treatment thus showed an advantage of more than 100 per cent over plain-air drying. Allowing only 50 per cent in practice, the value of the new process is obvious.

SPEEDOMETER EQUIPPED WITH MAGNIFIER

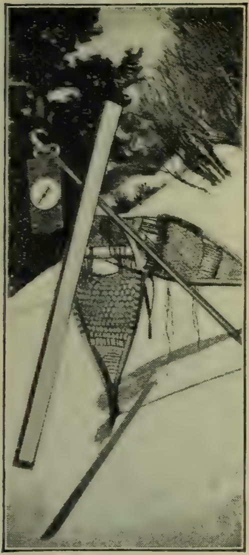
Several makes of European racing cars are now being fitted with what might be termed "magnifying" speedometers; that is, a magnifying glass of such focus and so placed in relation to the speedometer, that the latter may be easily and distinctly read from the driver's seat. It is claimed that the device brings the speedometer figures into full view without in the slightest degree diverting the driver's attention from the road.



A Special Magnifying Speedometer Designed for Use on Racing Automobiles

MEASURING A WINTER'S ACCUMULATED SNOW

By L. WILLIAM THAVIS

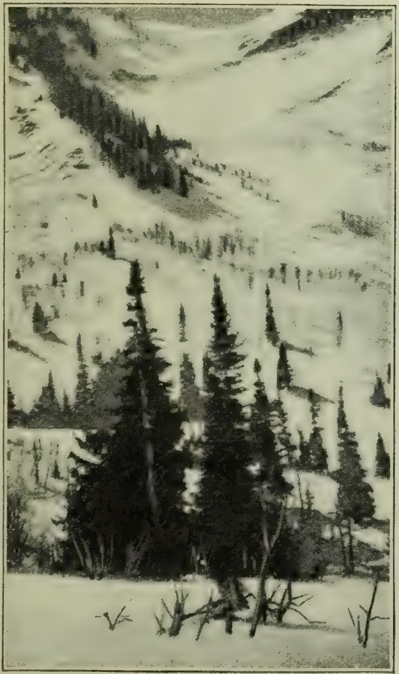


Outfit of Weather-Bureau Agent for Measuring Winter's Snowfall

An Example of the Difficulties Encountered by the Field Force

Measuring the vast annual snowfall in the Rocky Mountains to aid the farmers of the semiarid West in growing their crops more intelligently and profitably, is a new work in which the United States Weather Bureau is now engaged. These surveys are made in the great canyons and gulches just before the early spring planting season. Measurements of depth and density of the snow layer and its approximate area are computed by the Weather Bureau experts and a determination reached as to the season's water supply for irrigation and water power.

The irrigating farmer may ask: "How much water will I have this season?" He is interested in the quantity of water which the mountains will yield, no matter what kind of crop he may plant. His interest, of course, is entirely practical. If he knew just how much water he would have for the coming season, he could tell approximately the value of his crop. The engineer is equally interested in this question. If he were to build a dam either for power or for irrigating purposes or for both, a knowledge of the average amount of water which may be expected to pass a certain point would be of greatest value to him. And after the dam is built, such knowledge is of no less importance.



Snow-Filled Valleys in the Rocky Mountains Which Feed the Summer Streams

To the greater part, the moisture precipitated as rain or snow is evaporated from the surface of the oceans. After evaporation the water vapor is borne along by the general eastward drift of the atmosphere and precipitated according to the well-known laws of rain or snow formation. Snow is deposited on the lower levels in the winter time, but at the higher elevations the first snow occurs in the early fall and continues all winter and spring. At the very highest levels precipitation is in the form of snow even during the summer months.

The snow does not lie in an even layer over the mountain side, but is blown, not only during a snowstorm but by windstorms at other times as well, into gulches and ravines, forming immense drifts. And it is to the forming of these drifts that we owe our summer water supply. This snow becomes packed and solidified in many places to the density of ice. This density is due to the great depth of the drifts, the upper layers bearing down upon those underneath and packing them. As spring and summer approach these vast fields of packed snow begin to melt and yield water for irrigation.

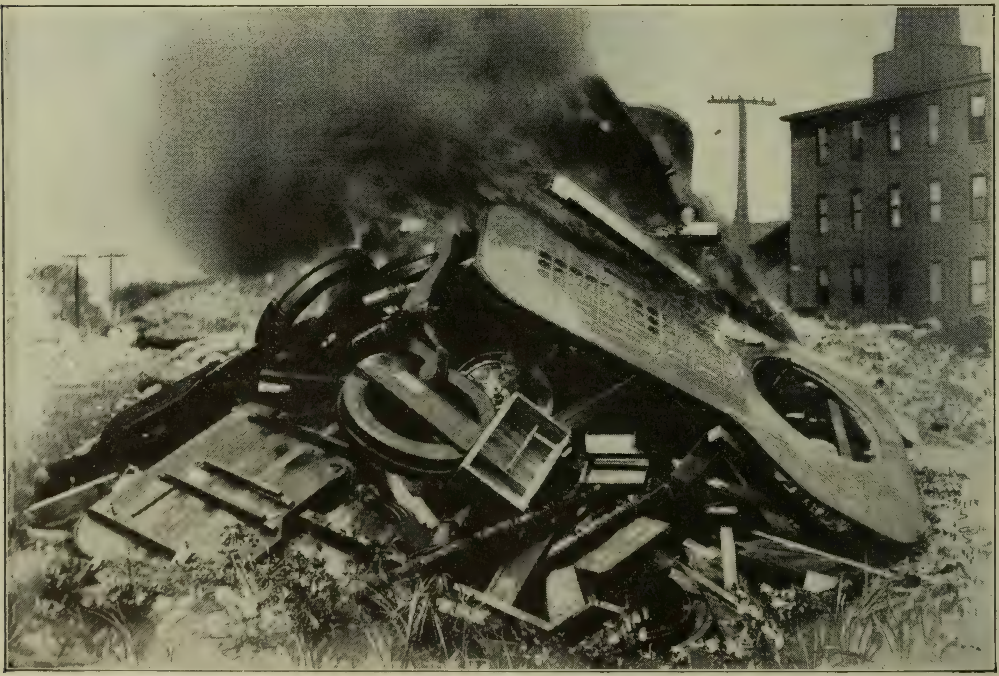
For computing the water equivalent of an area of snow in a watershed above an irrigation dam or canal, the expert uses an outfit, comprising a density tube and scale, an aneroid barometer, a compass, and a metal semicircle with plumb and pointer, to secure slope angles. Besides clothing suitable for work of this character snowshoes are an indispensable part of the outfit.

The density tube is an instrument made of galvanized sheet iron, 3 in. in diameter and 4 ft. long. It has a projecting iron "nose," resembling a saw edge, to facilitate perforating ice crusts or solidly packed snow. Outside the tube is a scale for measuring depths. The method of operation consists simply in plunging the tube into the snow layer and weighing the instrument with its core of snow. The scale on the balance is so arranged that the depth of water, equivalent to the snow layer, is read off at once. With the aid of other apparatus the total acreage of the watershed is measured.

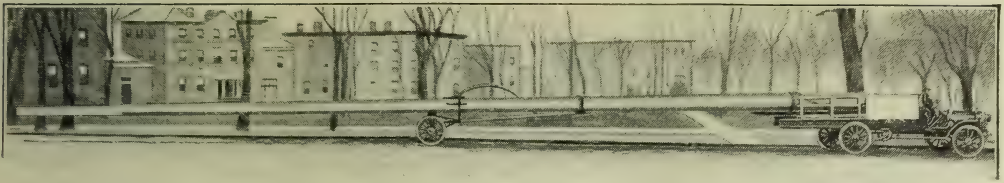
After the number of acres of snow layer, its depth and density are computed, a determination is readily reached as to the approximate quantity of water that may be expected to be supplied from the mountains in a given territory during the spring and summer seasons.

VALUABLE GAMBLING TOOLS IN POLICE BLAZE

The statutes of New York state require that all gambling apparatus confiscated by the police be burned. The Syracuse police, in following out the



Burning Roulette Wheels, Faro Outfits and Other Gambling Paraphernalia Seized by the Syracuse Police



Flagpole, 87 Ft. Long, Transported from Newark to Mendham, N. J., on a Motor Truck

letter of the law, recently destroyed apparatus to the value of about $8,000. The accompanying illustration shows clearly the bonfire made by the authorities. In the foreground is a large roulette wheel, which alone is worth a considerable sum. Three large vans were necessary to carry all the appliances to the dump.

TRANSPORTING BIG POLE ON MOTOR TRUCK

A remarkable feat in motor-truck transportation was successfully carried out recently in the transportation of an 87-ft. main section of a flagpole from Newark to Mendham, N. J., over a road having a number of steep grades. The section weighed 5 tons.

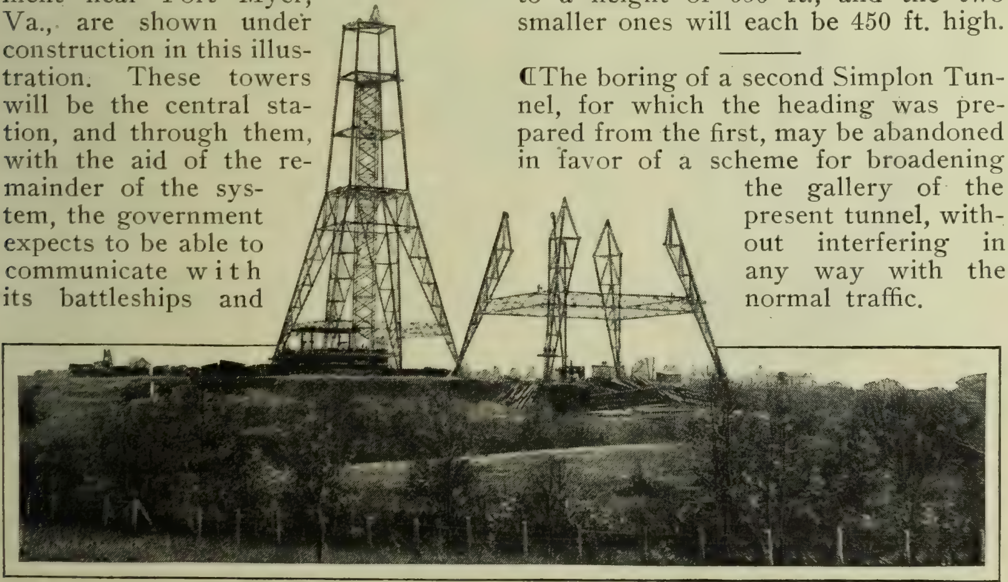
AEROPLANE MOTOR IN ENDURANCE TEST

In a recent test at the British military aeronautical field, located at Farnborough, Eng., a new 9-cylinder, 110-hp. motor ran 24 consecutive hours without a stop, developing an average of 113 hp. The fuel consumption amounted to 0.1 gal. per hour for each horsepower. The performance of this motor, according to the French journal L'Aéro, is without a precedent.

THE GOVERNMENT'S GREAT WIRELESS STATION

Two of the three great wireless towers being constructed by the government near Fort Myer, Va., are shown under construction in this illustration. These towers will be the central station, and through them, with the aid of the remainder of the system, the government expects to be able to communicate with its battleships and stations nearly all over the world. The tallest of the three towers will rise to a height of 650 ft., and the two smaller ones will each be 450 ft. high.

The boring of a second Simplon Tunnel, for which the heading was prepared from the first, may be abandoned in favor of a scheme for broadening the gallery of the present tunnel, without interfering in any way with the normal traffic.



The Great Towers of the Government's Central Wireless Station in Course of Construction

Private-Car Cottage Has All the Comforts of Home

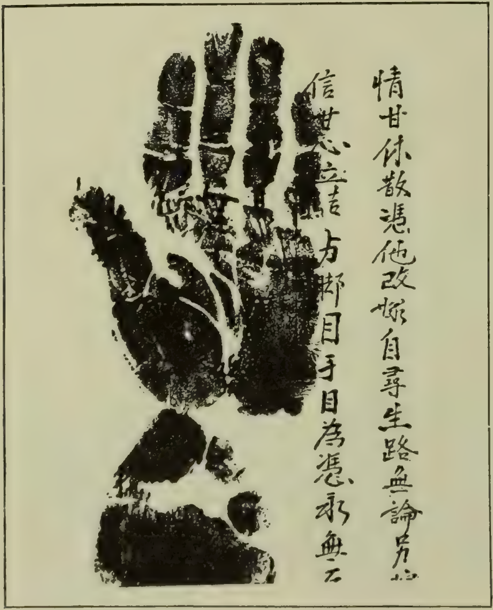
OLD RAILWAY COACH USED AS A COTTAGE

Though the private railway coach is regarded as a luxury of the very rich, there is at least one private railway coach, which, while a luxury, is not the property of a millionaire. This particular coach is doing duty as a summer cottage for a railroad man and is said to be a most comfortable home. It long ago ceased to travel on the rails and while still retaining its distinctive form, is also, literally, a vine-clad cottage. The man who lives in this house secured an old Pullman coach when he first conceived the idea. He had the old car placed on an unused siding, remodeled the interior into a bedroom, dining room and kitchen, erected porches at each end, planted a few flowers and vines and painted the sides of the car.

DIVORCED BY A FOOT AND HAND SIGNATURE

Divorce is an old institution in China and the use of finger and even foot prints, as identification marks, is as ancient, perhaps, as Chinese history. No court procedure is necessary for obtaining a divorce, only the consent of the families concerned. In the accompanying illustration is shown part of a divorce agreement signed by the imprint of a hand and a foot. The document reads in the following quaint manner:

"The writer of this divorce agreement, Hing Hing Wang, had once, at Sinntchoang, taken for wife the sister of Liou Lao Wei. Now when my family is as poor as if it had just been washed, there is not enough food and clothing. I can no longer support my wife. Therefore, in the presence of my wife, Mrs. Liou, I distinctly state that I consent to a divorce, that she can at her will enter another family or seek her own means of living. Let her marry any other man. I shall have no objection. Lest anyone should fear that I keep not my word, I have voluntarily written this document and in witness thereof put upon it the imprint of my foot and of my hand."



情甘休散憑他改嫁自尋生路無論另
信甘心立書方脚印手印為憑永無

Portion of Chinese Divorce Document Signed with Imprints of Both the Hand and the Foot

BUILDING TELEPHONE LINES WITH DYNAMITE

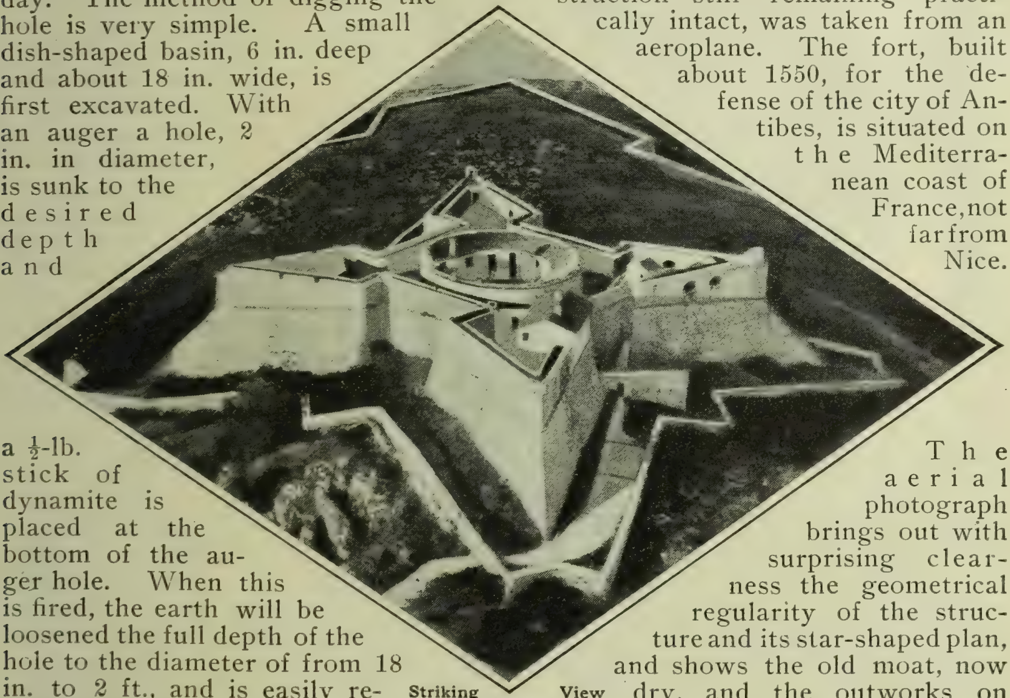
Dynamite promises to become an important aid to builders of telephone and telegraph lines in the future, when the ground is so frozen that the digging of holes for the poles is a difficult and tedious operation. Experiments that have recently been completed show that if pole holes are dug with dynamite, the cost is reduced from $1.75 to 35 cents per hole and that with ordinary labor, a mile of line can be constructed in this manner in a day. The method of digging the hole is very simple. A small dish-shaped basin, 6 in. deep and about 18 in. wide, is first excavated. With an auger a hole, 2 in. in diameter, is sunk to the desired depth and a ½-lb. stick of dynamite is placed at the bottom of the auger hole. When this is fired, the earth will be loosened the full depth of the hole to the diameter of from 18 in. to 2 ft., and is easily removed with a shovel.

STUDY CLOUDS BY MEANS OF MOTION PICTURES

Studying clouds that are 50 to 150 miles above the earth will be done in the near future by means of motion pictures, according to Willis L. Moore, chief of the United States Weather Bureau. Mr. Moore recently attended an international gathering of weather experts in London, and, in an address, declared that he believed it to be possible, and intimated he would attempt, to make moving pictures of the clouds at higher altitudes than have been attained in the past. By means of these pictures it will be possible for the weather experts to make minute examinations and add materially to their present knowledge. Motion pictures have been made of clouds at lower altitudes with excellent results.

FORTIFICATION PLAN SHOWN BY AERIAL PHOTOGRAPH

This striking view of one of the few examples of early fortification construction still remaining practically intact, was taken from an aeroplane. The fort, built about 1550, for the defense of the city of Antibes, is situated on the Mediterranean coast of France, not far from Nice.



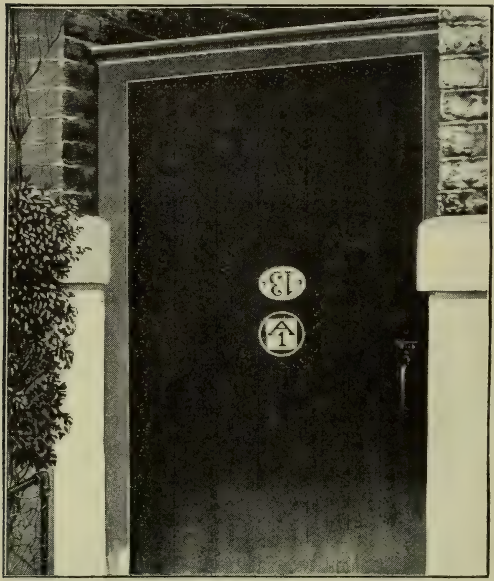
Striking View from an Aeroplane

The aerial photograph brings out with surprising clearness the geometrical regularity of the structure and its star-shaped plan, and shows the old moat, now dry, and the outworks on the shore of the sea.

¶Algot Lange, who is exploring the Amazon River for the University of Pennsylvania, is authority for the statement that savage races can no longer be tempted to part with valuables in exchange for brilliant-colored cloth and beads, and that guns, knives, hammers, axes and other useful articles must be carried in the explorer's pack, if he expects to secure samples of native handicraft in the unexplored regions of the world.

THIRTEENTH HOUSE HAS INVERTED NUMBER

The ownership of a house numbered 13 so worried a London woman that she wrote the city fathers asking permission to number it "12A," and, on being sternly refused, solved the difficulty in the manner shown in the illustration. She had the number plate put on upside down and renamed her house "A 1," placing the name plate immediately under the inverted 13. She was impelled to make such a change, she declares, by a series of minor accidents and annoyances which occurred in the house to members of her family, and which she attributes to the fateful number. Since the new number was affixed, the household has had peace and quiet, and the housewife feels sure her ingenuity is responsible for the banishment of the hoodoo.



Way in Which a London Woman Believes She has Overcome the Bad Luck Clinging to Number 13

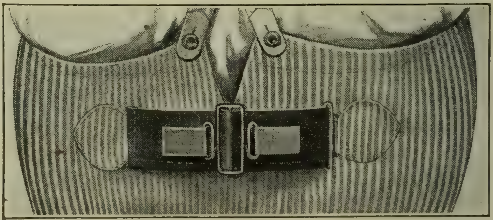
SCIENCE TO HELP RAISE INFANT OYSTERS

A new sort of commercial "chambermaid" is likely to be called into existence, whose duties will be to "make up beds" for infant oysters, that they may have every opportunity of growing into mature oysterhood and eventually find their way, in vigorous health, to the stew pan of some discriminating epicure. Dr. Joseph Stafford, of McGill University, has been studying the life and customs of the oyster, and has discovered a way to determine just when the extremely young oyster growths, or spat, are about to settle down to the floor of the ocean or river and start housekeeping.

There has never been a tenement-house commission or back-yard cleaning brigade for those particular sections of the sea or river bottoms where oyster cities are located, and consequently the young were frequently forced to lie on beds of slime, which had the same effect on the growth and development of the infants as the foul air and insanitary surroundings of some cities have upon the growth of children. Oystermen have never before been able to tell just when the settling period of oysters occurs, and consequently many promising families were cut off in the bloom of early youth. By means of Doctor Stafford's discovery, beds can be prepared at the proper time that will be free of slime and contain just the things to make oysters grow fat.

PINLESS SAFETY BUCKLE FOR TROUSERS

Worried for fear that the sharp pins of the strap buckle found at the back of certain makes of trousers might inflict injury on the fingers in the process of tightening or loosening, a French inventor has designed the arrangement shown in the drawing, the buckle of which has no sharp pins. The arrangement consists of two



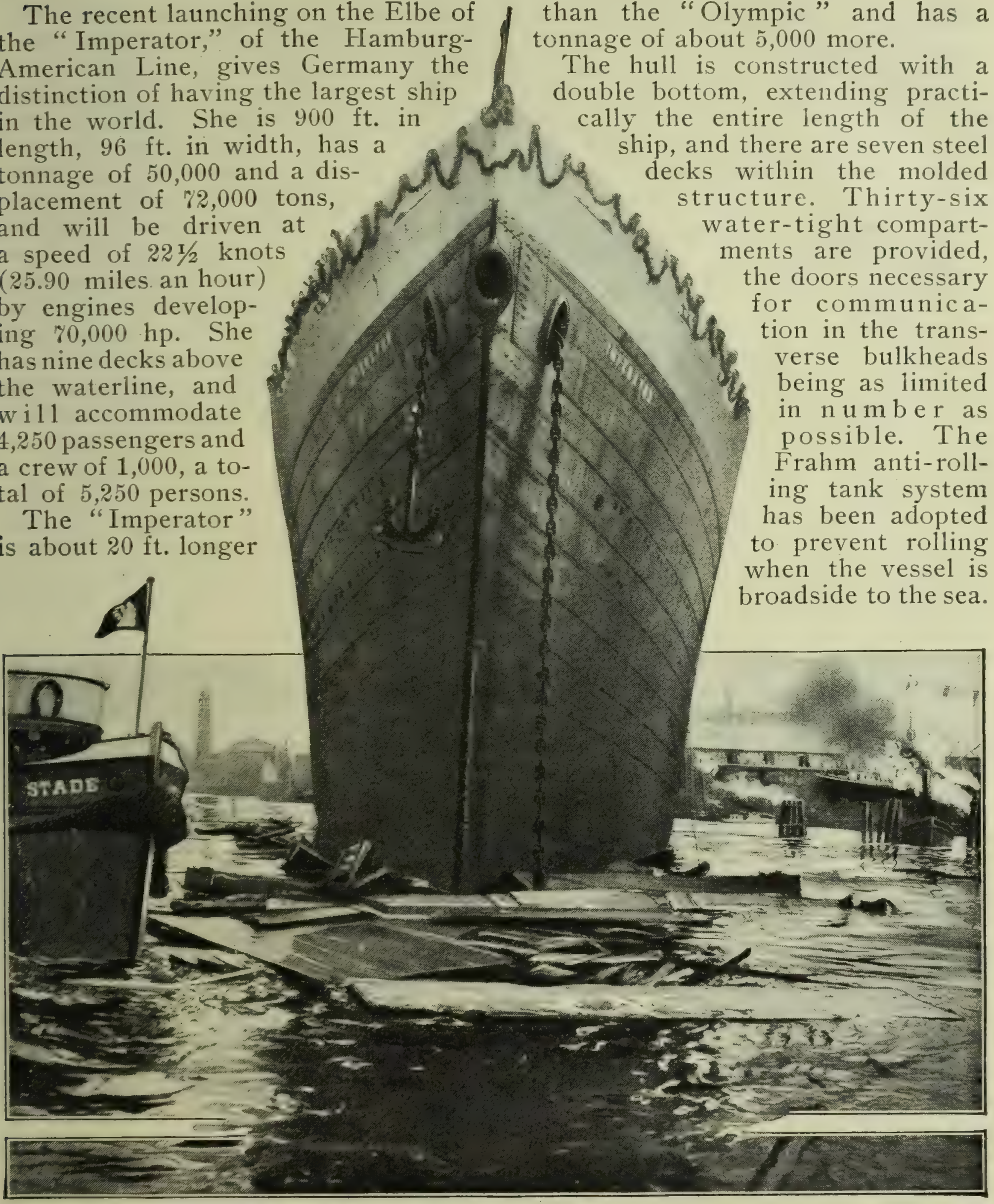
The Pinless-Buckle Idea as Adapted to the Back of the Trousers metal fittings having slotted ends, sewn to the trousers as shown. In these slots is inserted a band, one end of which is provided with a sliding buckle, while the other end is firmly attached to the slot of one of the metal fittings. The sliding buckle has two small straps, one on either side, the pulling of one or the other of which shortens or lengthens the band.

GERMANS LAUNCH THE LARGEST SHIP

The recent launching on the Elbe of the "Imperator," of the Hamburg-American Line, gives Germany the distinction of having the largest ship in the world. She is 900 ft. in length, 96 ft. in width, has a tonnage of 50,000 and a displacement of 72,000 tons, and will be driven at a speed of 22½ knots (25.90 miles an hour) by engines developing 70,000 hp. She has nine decks above the waterline, and will accommodate 4,250 passengers and a crew of 1,000, a total of 5,250 persons.

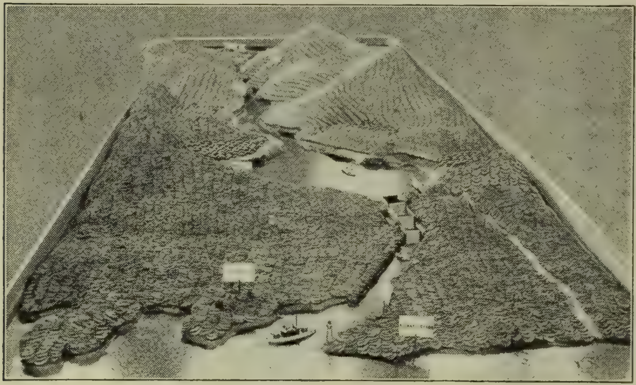
The "Imperator" is about 20 ft. longer than the "Olympic" and has a tonnage of about 5,000 more.

The hull is constructed with a double bottom, extending practically the entire length of the ship, and there are seven steel decks within the molded structure. Thirty-six water-tight compartments are provided, the doors necessary for communication in the transverse bulkheads being as limited in number as possible. The Frahm anti-rolling tank system has been adopted to prevent rolling when the vessel is broadside to the sea.



Standing Up Like a Skyscraper; the Bow of the German "Imperator" Just after the Launching

DRIED-APPLE MODEL OF PANAMA CANAL



Panama Canal Model, 30 Ft. Long by 8 Ft. Wide, Worked Out in Dried Apples by Students of the Watsonville, Cal., High School

The prize of $200 for the best feature exhibit of the last annual apple exhibition of Watsonville, Santa Cruz County, Cal., was awarded to a model of the Panama Canal worked out in dried apples by the students of the Watsonville high school. The model was 30 ft. long by 8 ft. wide, worked out from a detailed chart. Battleships guard the Atlantic and Pacific entrances of the canal, merchant ships are shown in different parts of the canal, the cities of Panama and Colon are represented by small colored houses, and lighthouses containing tiny incandescent bulbs are located at each entrance.

AN ERASER THAT REMOVES IRON RUST

A simple, but effective eraser for removing rust spots from an iron or steel surface is being marketed in France. To all outward appearance it is like the ordinary ink or lead-pencil eraser, although made in much larger sizes, and consists of a vulcanized composition of rubber and emery powder.

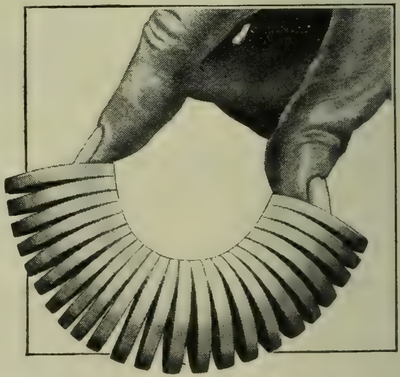
The eraser is particularly useful in removing rust from parts of automobile and aeroplane motors, and the like.

WOODEN TABLECLOTHS IN GERMANY

The German wood-pulp industry has found a new outlet for its material, in the form of household linen. The labor is long, but profitable. Owing to the shortness of the fiber, the wood pulp has to be first made into paper, and then rolled and twisted into thread. From this thread there are manufactured hat bands, carpets, tablecloths, and many other such articles of every-day use. Seventy-five cents worth of wood is thus made to equal $10 in paper yarn, and $38 as artificial silk. The system of making artificial silk from wood fiber, introduced in France many years ago, is now quite a commercial success in several European countries.

CAST-IRON SPIRAL SPRINGS

A cast spring, made of vanadium iron, is shown in a bending test in the accompanying illustration, demonstrating the utility of cast-iron springs made of this metal. The vanadium iron is not only tough, exceedingly malleable, close-grained and machinable, but has a remarkable elasticity as well. The spring shown can be ex-



A Cast-Iron Spiral Spring Made from Vanadium Iron

Tempering a Sword for Royalty in Japan

panded, compressed and bent through an angle of nearly 180 deg. without breaking. It is about 5⅜ in. long, and has been expanded to a length of 7¼ in., and compressed to 3¼ in.

¶In the first fly-swatting contest of record this season, held in San Antonio, Texas, 3,157,995 flies were killed by the children of the city.

CEREMONIAL SWORD TEMPERING

An interesting scene in the workshop of Massayoshi Morioka, one of the most famous makers of swords in Japan, is shown in the accompanying illustration. It shows the ceremonial tempering of a sword by order of the imperial household.

AN APPEAL TO INVENTORS

By I. G. HOOPER

The law of progress is ever calling on the inventor for new or improved creations. Just as he has mounted "up on wings like the eagle," the call comes for a practical instrument for testing the quality of air, automatic in action, constantly indicating the exact or approximate percentage of oxygen.

Such an instrument would be of inestimable value. A revised pure-air law would inevitably follow, compelling its use in every school, church, hall, factory, hotel, lodging and tenement house, etc., reconstructing all present methods of ventilation, thus abolishing countless ills, and raising the health standard beyond precedent.

The demand for such an innovation is urgent, and must sooner or later attract the attention of some inventor to whom there is no such word as impossible.

LONDON ADOPTS "SOLOMON" MASCOT

The famous "Billikin—God of Good Luck" mascot, which has reigned supreme in the world of mascots for the past few years, has been almost forgotten in London in the enthusiasm for a new mascot known as "Solemn Solomon." This is a quaint little figure represented as quoting Premier Asquith's famous words "Wait and see." Solemn Solomon is claimed to be a marvelous luck bringer, and to endow its possessor with the great wisdom that was Solomon's.

ROOF GARDEN AND GARAGE IN MILLIONAIRE'S HOME

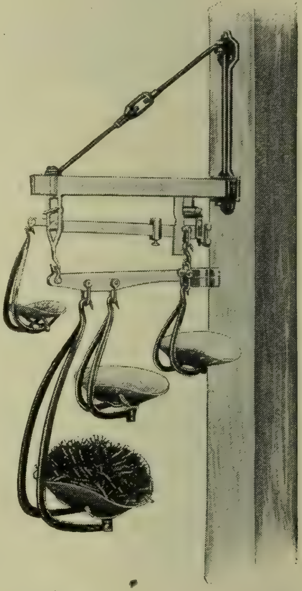
A three-story house that furnishes living quarters for a millionaire and his family, a roof garden, and a garage large enough for five motor cars, is one of the novelties in the building world. The house is being constructed at Milwaukee, Wis., for one of the prominent citizens. The roof garden will be fitted up in lavish style and the garage, which will occupy the greater part of the ground floor, is to be equipped with every appliance for keeping automobiles in condition for constant use. The living quarters of the family will be on the second and third floors.

ℭBrilliant red trousers for European soldiers are doomed to total eclipse, Austria having recently followed the example of France in clothing its troops in more somber garb.

CATCHING FISH WITH A LUMINOUS BAIT

The fishermen of Cezimbra, Portugal, are said to have developed a novel method of attracting fish, in which a yellow fluid pressed out of the abdomen of a fish found in the neighborhood, but rare in other waters, plays an important part. This fluid emits a bluish phosphorescent light in the dark, and the fishermen rub it upon the bait, which is thus made to glow brightly when in the water, attracting the fish.

INGENIOUS COUNTING SCALE



In the manufacturing plant of an American automobile-accessories concern has been installed a specially constructed scale for use in counting small parts. The upper scoop is the unit and the other scoops balance, respectively, at 25, 50 and 100 times the weight contained in the former. By counting out 10, 25 or 50 of the pieces to be counted and placing them in the upper scoop and then filling up one of the other scoops until the scale balances, the number of pieces in the latter may be determined by multiplying the number in the upper scoop by the number marked on the larger scoop. That is, if there are, say, 50 pieces in the unit scoop, the number in the largest scoop, when the scale balances, would be 100 times 50, or 5,000 pieces.

COMMENT AND REVIEW

Flying Bicycles

THE first steamboat, steam locomotive and glider each aroused the derision of the public in their first attempts. Such was the fate of the contestants who entered for the first public competition of motorless flying machines. The prize was $2,000, but out of 198 entries only 25 actually competed. The machines were quite similar in construction, being merely bicycles or tricycles fitted with planes and propellers. The motive power was furnished by the rider by means of the pedals. "Aviette" is the name bestowed on this latest device in the art of flying.

To win the prize one had to rise from the ground, if only a few inches, and travel a marked course of 33 feet. A second prize was offered to anyone who flew over two strings placed only four inches apart. All the trials met with failure, the performance being likened to the antics of a lot of cowboys trying to ride bucking bronchos. Some of the inventors were absolutely exhausted after their fruitless efforts to get their machines off the ground, but at no time was any one in peril, unless it was the spectators. L'Aéro, however, treats the matter seriously, and says: "The contest, although a failure, has not proved the impossibility of motorless flight. By displaying before the public machines which lack even common sense, an impression has been created that the problem is more difficult than it really is." Paulhan, who won the $50,000 prize for the flight from London to Manchester, comments: "None of the competitors understands the problem, and the motorless flying machine does not yet exist." Tissandier is quoted as saying: "They all lack scientific knowledge and their propellers are nearly all feeble. While I think it is possible to fulfil the requirements of the Peugeot prize, I don't think any aviette will be able to fly for many miles." As experiments involve neither personal risk nor great expense, some of our young inventors might find considerable amusement, if not profit, in attempting to work out the problem.

* * *

Panama Canal Too Small

THAT the limit in the building of big ships has not yet been reached or even decided on, is the opinion of the recent International Congress of Navigation. As to what the final extreme length of ships may be no one seemed willing to definitely commit himself. The subject came up during the discussion of a report in which it was recommended that a limitation in size might be secured by refusing government aid to the building or operation of sea-going vessels whose maximum dimensions exceeded, length, 900 feet; breadth, 105 feet; draft, 32.2 feet. At the same time the prediction was made that the time was not far distant when the Panama Canal will be too small to permit the safe passage of the great ships of the future. Naturally the loss of the largest ship afloat was discussed in its bearing on future construction, but the opinion was that that event would serve as no deterrent; that a smaller ship with the same injury would not have remained afloat nearly as long.

On land the tendency is unquestionably toward centralization and large units, with a result of better service and greater economy. The isolated electric plant, cannot, ordinarily, compete with the large stations in big cities. Railroads are building larger locomotives to haul longer trains. Steel buildings that were erected only 10 years ago and which should last a century are being pulled down to be replaced by taller structures. Whether this same tendency will work out equally well when applied to the operation of monster freight carriers at sea is yet a disputed question.

* * *

Titanic American Owned

IT will be news to many of our readers that the "Titanic" was practically owned in this country. Such was the statement of Mr. Ismay, the managing director, when giving his testimony before the British Commission of Inquiry. The White Star Line he named as one of several companies whose aggregate tonnage is nearly one million, and which are known in England as the American Trust. The president of the commission inquired why American-owned ships should be operated by British companies and managers, and was told these boats cannot fly the American flag because not built in the United States. The president asked, "In substance, the 'Titanic' was an American-owned ship?" and Mr. Ismay answered, "That is true."

In view of this fact and that hundreds of the passengers were Americans, our Senate Committee investigation can hardly be termed "ill advised."

* * *

Museum of Aviation

IN nearly all the great museums of the world will be found models of the first railroad locomotive and first steamboat, and in several a series of models of each, showing their progress and evolution down to the powerful machines of today. Inasmuch as the art of flying is doubtless yet in its infancy, the opportunity is afforded some museum to collect and preserve the earlier types of aeroplanes against that future day when the best types of the past few years will, perhaps, appear as crude as the "Rocket." In their beginning the importance of first inventions rarely is considered at full value—usually as of no value whatever. Here is an opportunity for someone to make an endowment which will secure and preserve as many as possible of the original, or, where that cannot be done, models, of the early flying machines, and follow with additions marking the progress of the art. In fifty years such a collection would be beyond price.

* * *

International Weather Bureau

WITH a weather bureau more extensive in all its scope and details than any other in the world, it was fitting that our own chief of service, Prof. Willis L. Moore, should be the leading figure in the recent international congress held in London. The plan is to form an International Weather Bureau, working chiefly through ships at sea. With wireless already in general use this becomes possible, and is so obviously for the equal advantage of every country concerned that it becomes one of the very few things where all benefit without disadvantage to any. The suggested plan includes daily or less frequent reports to either the American or European clearing house, whichever the sending ship is nearest, and the making up of the forecast, which will be sent out and passed from one ship to another. In this way rough water can be avoided by changing course of larger craft, and small steamers and sailing vessels would often escape injury or even destruction. The coöperation of the several countries interested in the undertaking would furnish one more tie of friendly relationship.

* * *

Something for Nothing

HUMAN nature is evidently pretty much the same everywhere, at least in certain respects. It seems to be a generally fixed condition in rich and poor, civilized and savage, to want to get something for nothing. Learned men write glowing testimonials and receive a set of books in return; bankers lend the institution's money at good rates and excellent security, and pocket a block of stock at the same time; even an eagle secures its prey as the frightened fish hawk drops the fish it has so patiently worked to capture. Something for nothing. The latest evidence of this is seen in catchy advertisements now appearing in papers in England of a wonderful machine, purchasable for a few shillings, which makes two pounds of butter out of one pound of butter and one pint of milk. This is the same scheme which was worked on this side, and with some success until it was exposed in this magazine. Something for nothing! Two pounds of butter by adding one pound of liquid, chiefly water. As a matter of fact, practically the same result is obtained by using water instead of milk. The deception is based on the well-known ability of butter to absorb its own weight of liquid. The result is bulk, not butter, and the regrettable feature of the fake is that it finds its victims chiefly in those who can least afford to lose their shillings. The something for nothing makes easy victims and fat pocketbooks for swindlers.

* * *

Lifeboats "Absurd"

LIFEBOATS are "not necessary," "not wise," and "absurd," or at least a sufficient number of them to provide for every passenger—entirely overlooking the crew—is so considered in the judgment of Harold Sanderson, a director of the White Star Line. And this astounding statement was not made before the "Titanic" went down, but less than 60 days after that disaster. If there have been any doubts as to the necessity of stringent governmental control, they must now fade away before such a policy as this. And the remark was not an accidental word, carelessly dropped in casual conversation as the private opinion of an individual. It was part of the sworn statement of a man testifying before the British investigating board as a director of the White Star Line. But this is not the worst. The same witness went on to relate how, to appease public clamor, the "Olympic" on her first westbound trip after the great disaster did carry sufficient boatage to provide room for every soul on board, women, children, men and crew. "We started," testified Director Sanderson, "to have a number on board equal to the number of souls the vessel carried, but we saw that was absurd, so we reduced them."

As long as there are boats sufficient to save managing directors while the less fortunate passengers are getting drowned, what matters?

With such a policy as that, now, while tears are yet flowing for the dead, can there be any surprise that the "Titanic" was so miserably equipped. Being questioned a second time whether in the interest of public safety there should be (life) boat accommodation for every passenger and every member of the crew, Mr. Sanderson replied, "In the same interest my answer is that it is not necessary and is not wise."

This announcement cannot but cause a decided shock to American travelers, however complacent our British cousins may be. If there be any "absurdity" in so serious a matter, is it not rather that British freight steamers must carry lifeboats for double the number of men on board; while a passenger ship intrusted with a hundred times as many lives is allowed to leave port equipped to save but a fourth or a third!

It was offered in excuse that "there are certain risks in connection with going to sea, which it is impossible to eliminate, just as there are risks in traveling on land"; and Lord Mersey, president of the commission, seconded Mr. Sanderson with "Quite right, every person who goes to sea, or for that matter walks on land, must accept some risks."

The man in the street has some choice, he can take the other side or use another street or wait until a joy rider has passed; but once on the high seas he is without alternative. He cannot control the disposition of his own dead body or even that of his wife: The captain, whose word is law, can sew him in a sack and dump him overboard. Of course there is risk in going to sea, which is precisely the reason why steamship companies which have so little regard for the safety of their passengers should be compelled to reduce that risk to a minimum. That government has and can exercise such regulation is unquestioned. If for instance an American ship attempted to land its passengers stricken with some terrible plague at a British port, would there be any hesitation in using cannon to prevent such landing, if necessary?

"Lifeboats absurd!" That the "Titanic" could sink was also "absurd"—once. It is the fancied absurdities of life that have made most of its greatest tragedies. As the hundreds of brave victims slowly sank into the icy waters of the North Atlantic we can imagine their last words—

"Lifeboats? How absurd!"

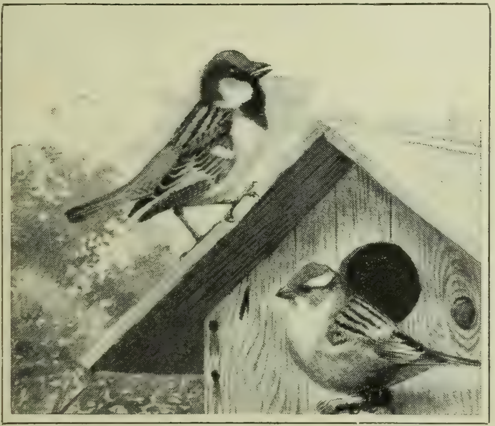
H. H. WINDSOR

UNCLE SAM URGES A STERN WAR ON SPARROWS

By L. T. WILLIAMS

English sparrows are abundant in every town and city in the United States and in many suburban districts. They are noisy, filthy, and destructive. They drive native birds from villages and homesteads. Though they are occasionally valuable as destroyers of noxious insects, all things considered, they do far more harm than good.

Uncle Sam, through his Department of Agriculture, has planned ways and means for the extermination of this pest. His recommendations of practicable methods of dealing with the sparrow include the destruction of nests, trapping and poisoning, urging trapping as unquestionably the best. English sparrows are good to eat, he says, and their use as food is recommended, because of their nutritive value, as a means of reducing their numbers. They have been eaten in the Old World for centuries. In many of the first-class hotels and cafés of this country the sparrow is served to patrons as a "reed bird." Uncle Sam says the difference in taste is not discernible.



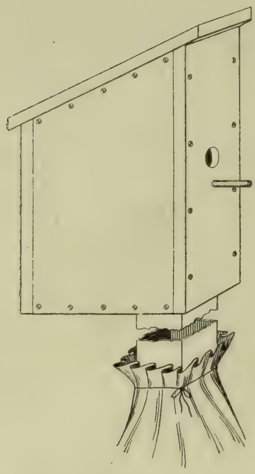
Sparrow Trap, Showing Small Entrance Which Keeps Out Other Birds

The English sparrow was introduced into America a little more than 60 years ago, and is now distributed in vast numbers over all the United States and Canada. This rapid dissemination is a result of the bird's hardiness, extraordinary fecundity, diversity of food, aggressive disposition and almost complete immunity from natural enemies.

On the farm and in the city the sparrow is a notorious pest. It destroys fruit, as cherries, grapes, pears, and peaches. It also destroys buds and flowers of cultivated trees, shrubs and vines. In the garden it eats seeds as they ripen, and nips off tender young vegetables, especially peas and lettuce, as they appear above ground. It damages wheat and other grains, whether newly sown, ripening or in shocks. As a flock of 50 sparrows requires daily the equivalent of a quart of wheat, the annual loss caused by these birds throughout the country is extremely great. It reduces the numbers of some of our most useful and attractive native birds, as bluebirds, house wrens, purple martins, tree swallows, cliff swallows, and barn swallows, by usurping nesting places and destroying their eggs and young. It attacks other familiar species, as the robin, wren, red-eyed vireo, catbird and mocking bird, causing them to desert parks and shady streets. Unlike our native birds whose place it usurps, it has no song, but is noisy and vituperative. It defiles buildings and ornamental trees, shrubs, and vines with its excrement and disfigures them with its bulky nests.

The evidence against the English sparrow is, on the whole, overwhelming, and the present unfriendly attitude of the public toward it is reflected in our state laws. Nowhere is it included among protected birds.

One of the greatest objections to the English sparrow is its aggressive antagonism toward the small native birds, especially those familiar species which, like itself, build their nests in cavities. Nest boxes provided for bluebirds, martins, or wrens—birds both useful and pleasing—too often fall into the possession of this graceless alien, either by the right of discovery or by piratical assault. Fortunately, it is possible to aid the native birds by selecting suitable nest boxes. Thus, a box having an entrance 1 in. in diameter will admit house wrens, but not sparrows. Boxes for larger birds may be constructed so that any unwelcome tenants can be readily evicted. When a sparrow has had its nest and eggs removed from a box, it not only as a rule seeks another place for its next nest, but is likely to avoid that type of nest box in future.



Sparrow House with Trap in Floor and Bag Catch

Sparrows become a nuisance in cities by roosting in ornamental vines and in crevices about buildings. If scared out late at night, several nights in succession, they will desert the roost. A stream of water from a garden hose is a potent means of eviction. Where water is not available, small Roman candles may be successfully employed.

Though sparrows may be driven from a given neighborhood, the nuisance is merely transferred elsewhere. Here is where Uncle Sam prescribes more drastic measures. He says the most effective method of preventing the increase of sparrows is to destroy their nests at intervals of 10 or 12 days throughout the breeding season. Occasionally they build large covered nests in trees, but as a rule they build open nests in bird houses, electric-light hoods, cornices, waterspouts, and similar places.

The sparrow's habit of nesting in cavities can be turned to account against it. By providing one-room bird houses or even packing boxes or tin cans, and putting them in trees or on a pole or buildings at a height of at least 10 ft., the birds may be easily captured after dark with a long-handled net. Another method suggested by the government experts for the destruction of this pest is shooting them with No. 10 shot, when they are feeding in large flocks.

In localities where the use of firearms and poison is restricted, the most effective means of extermination in a given territory is the nest-house trap, the funnel-shaped wire-netting trap, and the sieve. Of these devices the nest-house trap is particularly successful. It comprises an ordinary bird house, with a light tipping chamber or floor, a down spout, and a bushel bag to hold the captives. This contrivance is known as the Tesch nest-box trap and is widely used in large cities.

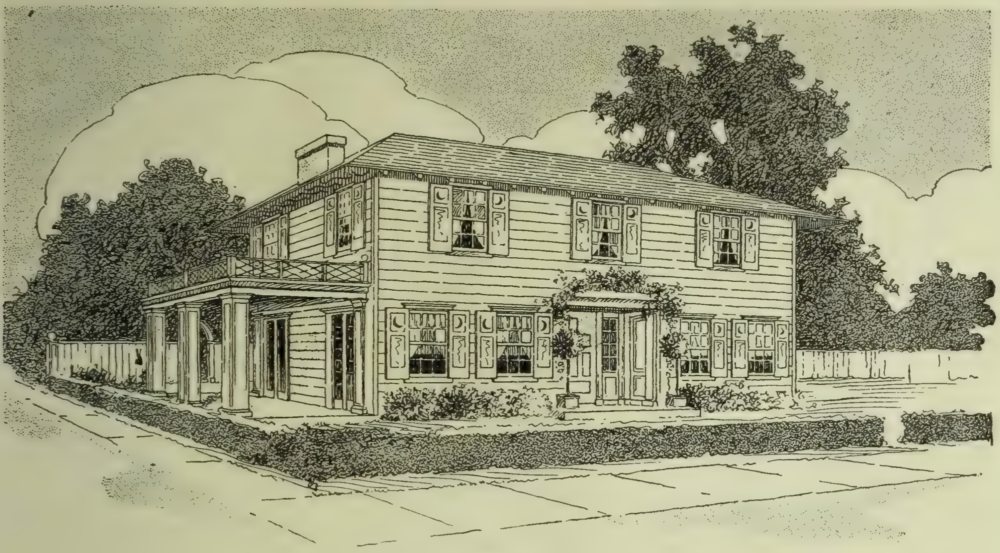
Where extraordinary trapping is undertaken by city authorities, the funnel wire-netting trap is used in places where sparrows are accustomed to assemble in large numbers. Live sparrows are placed within the device to facilitate a catch, the trap being baited on the floor of the first inner chamber, with seeds and small grain.

SPEEDOMETER SHOWS ELEVATOR TRAVEL

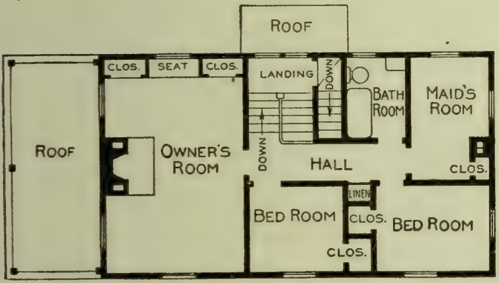
A speedometer for elevators is being placed on the market by a Chicago concern. It can be quickly and easily attached to the head shaft or in the end of the driving shaft of the elevator mechanism, where it records all elevator mileage. With such an attachment all guesswork as to how many thousand miles a set of cables travel is done away with, thus making it possible to base cable guarantees upon car mileage.

¶A tract of land about a mile and a quarter wide has been secured for the erection of a mammoth wireless station at Port Monmouth, N. J., to be used in connection with the trans-Atlantic service.

AN ITALIAN VILLA THAT WILL COST BUT $4,900

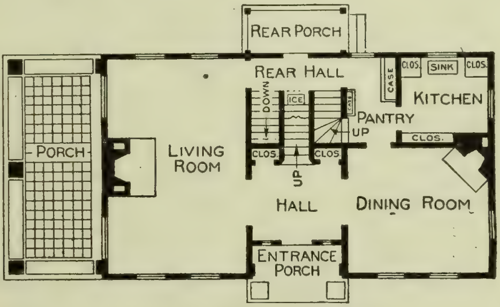


Front Elevation of the Italian Villa



Leon Carson, Architect, New York

Second-Floor Plan



First-Floor Plan

There was once a time when only the wealthy could hope to own an Italian villa. That day has passed, however, and now this alluring style of architecture is being used for homes of men of small means. The Italian idea worked into a home for a small family has resulted in the presentation of a number of very pretty plans. The house shown in the accompanying plans was especially designed to meet the needs of such a family. The estimated cost is $4,900 based on the price of materials in New York City. Seven rooms, large hallways, and ample closet space are provided. The architect intended this house to be built of wood, the exterior painted white with green trimmings. All the interior woodwork should be hardwood, properly stained. It will be noted that the living room, the owner's room, and the porch are exceptionally large and light.

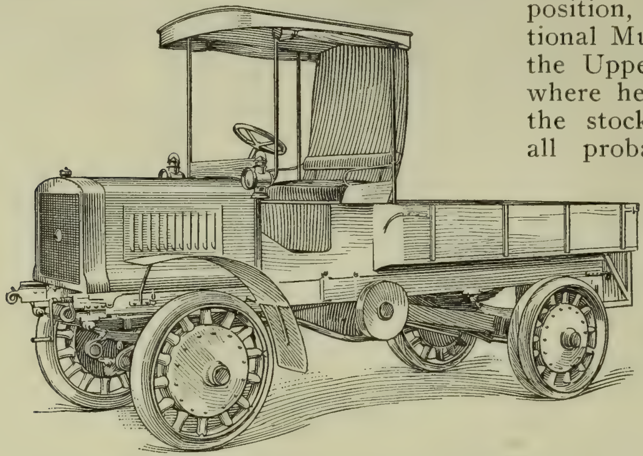
GASOLINE PRODUCTION FROM NATURAL GAS

The extent of production of gasoline from natural gas, particularly the natural gas from oil wells, is steadily growing. One of the interesting developments is the extraction of oils of low boiling point from wells by attaching a vacuum pump to the well casing and causing the oil to distill out with the gas. This is condensed again at the atmospheric pressure, the gasoline thus obtained being heavier and more valuable for general use than the lighter products.

¶Lawn tennis has become an exceptionally popular sport among high-school and college students in Japan.

A MOTOR TRUCK WITH FOUR DRIVEWHEELS

This motor truck, constructed in France, is designed to carry heavy loads on roads having steep grades but no sharp curves. All four wheels are both driving and steering wheels, driven by a 6-cylinder motor giving 35 hp. at 1,000 revolutions per minute, and 45 hp. at 1,400 revolutions.



A French Motor Truck, Driven by a Gasoline Engine, All Four Wheels of Which are Used for Both Driving and Steering

The wheels are so connected to the steering gear that the front and rear wheels on each side are each turned to the same degree in steering, and thus the rear wheels follow in exactly the same line or track as the front wheels. By means of a single differential of special construction, which is one of the chief features of the car, it is possible to provide the necessary difference required in the speed of the left and right-hand wheels to obtain correct running in a curve.

¶According to the food-inspection decisions of the Department of Agriculture, canned foods will be deemed adulterated if they are found to contain water, brine, syrup, sauce or similar substances in excess of the amount necessary for their proper preparation and sterilization. Some food products, such, for example, as tomatoes, may be canned without any other substances whatsoever.

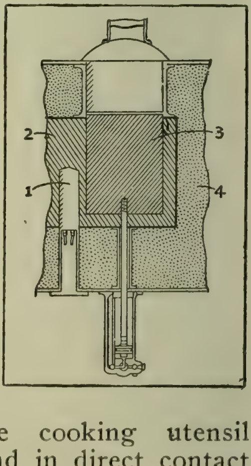
TRACING THE AMERICAN INDIAN TO ASIA

In preparation for the extensive anthropological and ethnological exhibits of the Panama-California Exposition, Dr. Ales Hrdlicka, of the National Museum, is on an expedition to the Upper Yenisei region of Siberia, where he will study the remnants of the stock of people from which, in all probability, the American race branched off.

Among the natives of the Yenisei are found physical types identical in every essential respect with the American Indian. This type extends from the Yenisei as far as Tibet, and it is the plan of Dr. Hrdlicka to make a rapid survey of the numerous and little-known peoples to be found there. He will come into as close a contact as possible with many of the native tribes, securing photographs and casts of the individuals as well as of material objects.

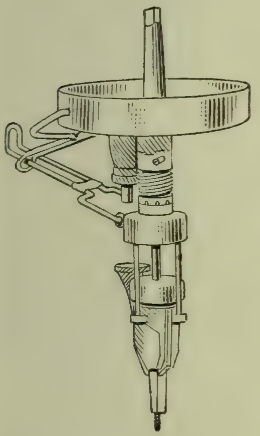
AN ELECTRIC STOVE THAT STORES ENERGY

A stove designed to consume electrical energy continuously at a constant low rate throughout the entire 24-hour day, and give off energy quickly, as needed for cooking purposes, has been patented by a Massachusetts inventor. The energy is stored thermally in masses of cast iron, insulated from external influences by means of lampblack or powdered silica. The cooking utensil rests on top of and in direct contact



with the block of cast iron during the cooking operation. In the illustration, the heating element is shown as 1; the heat-storing masses, as 2 and 3, and the heat-insulating material, as 4. The mass 3 is connected to a hydraulic plunger so that it may, at will, be elevated to expose its upper surface for cooking purposes, or lowered to retain the heat.

AUTOMATIC MAGAZINE SCREWDRIVER



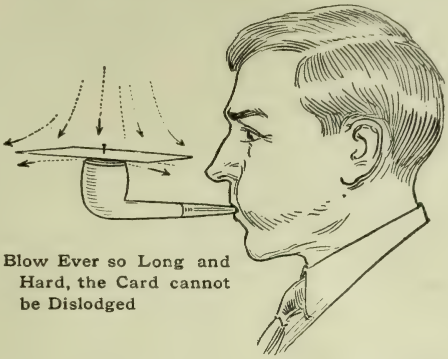
An automatic magazine screwdriver for driving metal screws into tapped holes has been brought out by an English concern. The apparatus is merely an attachment to an ordinary drilling machine and is very rapid in its operation. When the screw is bottomed, the screwing head is automatically tripped, the spindle continues turning, automatically feeding another screw into the head, which was released from the previous screw by the tripping action; and the machine is ready for placing a screw in the next hole.

A similar machine for driving screws into wood is also supplied by the same concern.

BLOWING A CARD FROM A PIPE

At first thought, nothing would seem simpler than blowing a card off from a pipe, if the card is laid horizontally on the bowl of it and one blows through the pipe stem; but when one tries it, he is amazed to find that he cannot do it. In order to make the experiment satisfactorily, a pin should be put through the card into the bowl of the pipe, so that it cannot slide off sidewise. Under these conditions, the card cannot be blown from the pipe except occasionally by a very sudden puff.

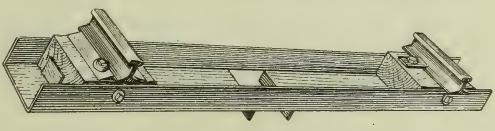
The uncanny fact that the card cannot be blown from the pipe depends upon some of the peculiar principles of aerodynamics. One would feel certain that, when he blows, the card would fly immediately into the air. It will be noticed, though, that the column of air which ascends is only as large as the bowl of the pipe, while the surface of the card which is expected to be lifted is many times greater. As soon as the card rises a little, the downward pressure holds it to such an extent that the air flows out sidewise in every direction along its surface. When it gets to the edge of the card, it draws some of the air from the upper side along with it. This causes a current of air from above to descend upon the card and to hold it down.



Blow Ever so Long and Hard, the Card cannot be Dislodged

COMBINED HARDWOOD-BLOCK AND STEEL TIES

A new type of steel railway tie, claimed by its inventor to possess all the good points of the wooden tie in combination with the best features of the steel tie, is interesting railroad men to such an extent that several roads, both east and west, are about to give it a trial.

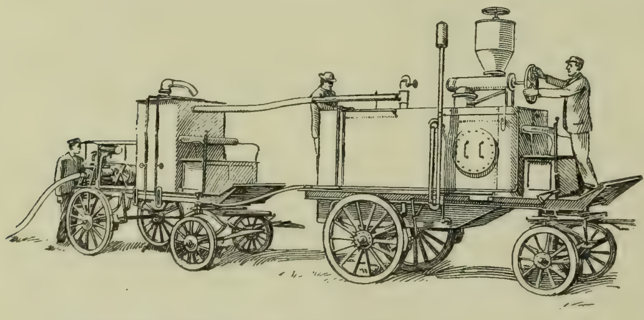


A Steel Tie Claimed to Have All the Advantages of Hardwood or Creosoted Ties, and All the Additional Good Points of Steel

It is said to be the only steel tie that requires no insulation, as the rails rest upon hardwood blocks; that it is noiseless, and that it does away with the resiliency of steel on steel, which is present in practically all other steel ties that have appeared. The different features of the tie are clearly shown in the illustration: the hardwood blocks and method of securely fastening them in the steel channel; the method of attaching the rails to the blocks, and the open space in the bottom of the tie at the center, which is provided to prevent center-binding and to keep the track from getting out of line. The channel is filled with road ballast.

PORTABLE HYDROGEN GENERATOR

The fact that a more general use of the dirigible balloon is made in Germany than in any other country has led to the invention of several types of hydrogen generators, stationary and portable. One of the latest portable plants is shown in the accompanying illustration. It utilizes the silicon-sodium-hydroxide process, and requires no external application of heat in the generation, necessary heat being supplied by the reaction itself. A small gasoline engine is used for drawing the required water supply from any convenient source. The production of one cubic foot of hydrogen requires only about 1 oz. of silicon and 1.2 oz. of caustic soda. The plant has an hourly capacity of about 4,200 cu. ft.



A Portable Hydrogen-Generating Plant Designed to Supply Dirigible Balloons

CREMATORIES HEATED BY ELECTRICITY

There has been in successful operation at Oakland, Cal., for the last few months, an electrically heated crematory. This crematory has three retorts, each consisting of a brick-lined chamber with an arched covering. Along the two inside walls is placed about 70 ft. of ⅝-in. calorite resistance rod. The body to be cremated, inclosed in its casket, is put in place while the retort is cold. An electric current of about 85 kilowatts is then supplied to the resistance rod, and in 30 to 60 min. the temperature in the retort rises to approximately 2,000 deg. F. As the temperature of the retort increases, the volatile products go off as gases, and after about two hours nothing remains but the ashes, which are collected on a clean tray beneath.

This method of cremation not only eliminates the disturbing flame and roar, and dirt of the ordinary incineration plants, but at the same time allows the furnishings of the building to be made as elaborate as in any chapel.

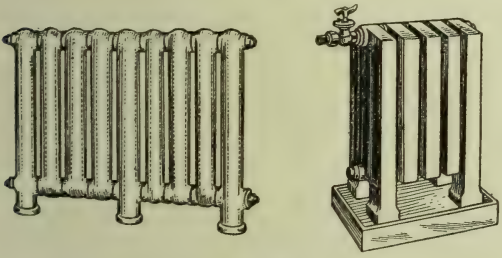
DEVICES WARN OF DANGER OF ELECTRIC SHOCK

A high-tension circuit may be dangerous to anyone working on a neighboring low-tension circuit, owing to the electrostatic effect produced, quite apart from any question of leakage. This and leakage are both dangerous to linemen and a number of instruments have been designed to give warning. Vacuum tubes or sensitive telephone receivers are said to constitute the best protection. If a high-tension circuit is approached by a lineman holding a sensitive telephone to his ear, and keeping a finger on one terminal and leaving the other free, a clear buzzing is heard 3 or 4 yd. away from the conductor, caused by a small charging current passing through the coil, then through the observer's body to the earth. The vacuum tube is used by hanging it on the suspected cable, where it glows, if high pressure is present.

GERMAN CONCRETE RADIATORS

Germany has found concrete to be an excellent material for the construction of radiators for steam and hot-water heat, and at recent hygienic exhibitions such radiators were shown in all possible forms and colors.

The most important feature of these radiators has to do very intimately with hygiene. Being porous, they furnish moisture as well as heat to the air in a room, which is most desirable. It is also stated that they heat more quickly and cool off more slowly than an iron radiator, and that they cost much less than the latter.

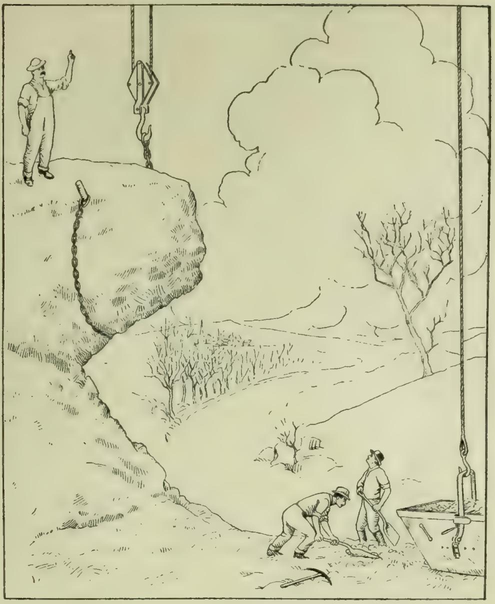


Two Forms of Concrete Radiators Constructed in Germany

The radiators are formed by pouring a mixture of cement and sand into special gypsum molds, or iron castings, and can be made in all colors and shapes. The thickness of the walls is about ⅜ in.

EXCAVATING FROZEN EARTH WITH DERRICK CHAIN

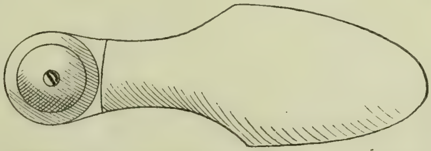
During the work on one of the New York subways last spring a large pile of excavated material which had been conserved for use as concrete aggregate had become frozen to a considerable depth. In making use of this material the shovelers cut under the pile, and the projecting knob was then cut off in the ingenious manner shown. A steel bar was driven into the projecting mass, the end of a chain was made fast to the bar and looped around under the knob, and a pull of the derrick cable sheared it off neatly.



An Ingenious Method Adopted to Cut Down a Frozen Projection of Earth

REVOLVING RUBBER HEEL

A novelty in rubber heels is one which revolves slightly at every step. The idea of the revolving feature is to prevent it from running over or wearing high in the middle. It is also claimed to prevent the collection of snow or dirt.



A Rubber Heel that Revolves Slightly with Every Step

Captain Amundsen has announced his intention to start on an expedition to the North Pole next year, leaving San Francisco next March or April.

THE BIGGEST PUMP KNOWN — THE SUN

By F. R. MOULTON

Among the most powerful modern machines are the great pumps used in supplying water to cities and raising it out of deep mines. One of the largest pumps in the world is at Bethlehem, Pa. It is driven by a 7,000-hp. engine. When it is remembered that one horsepower will raise 16½ tons one foot a minute, the immense power of this pump is apparent.

It is an inspiring sight to see the immense machinery of modern industry doing the work of thousands of men. But there is a larger pump than any man has ever invented which works silently and continuously all around us. Reference is made to the sun which raises into the atmosphere all the water which falls in the shape of rain or snow. It is clear that all the water which runs in the thousands of rivers that cover the earth and which fills its great lakes, came down originally as rain; for all of these bodies of water would soon fail if they were not replenished from the skies.

A little computation will show that an astonishing amount of water falls on the earth every year. Even a big rain is a much more important thing than is ordinarily supposed. In summer there are rains in which almost an inch of water falls over a large area, and occasionally there are those when two or three inches fall in the course of a few hours. An inch of water on an acre weighs over 100 tons, and on a square mile, more than 60,000 tons. Rain ordinarily falls from a height of about half a mile. The fact that it ascends in the form of vapor does not mean that the same work was not expended to raise it, as would have been done if it had been elevated to that height as water. The same amount of energy is used in one case as in the other.

The average rainfall for the whole United States per year is about 20 in. That is, on the average 1,200,000 tons of water falls each year on every square mile in this country from a height of half a mile. There are in the United States 3,600,000 square miles. Therefore the sun has pumped up the 4,320,000,000,000 tons of water which each year fall upon the United States.

A simple calculation shows that one horsepower will raise about 3,500 tons one half mile in one year. Therefore it would require 1,200,000,000 hp., working continuously, to pump up the water to the sky which falls as rain on the United States. But the area of the whole world is 50 times that of this country, and the average rainfall on it probably does not differ much from 20 in.

It follows from this discussion that the sun pumps up annually from the earth more than 20,000,000,000,000 tons of water. It is, therefore, immeasurably beyond the most powerful pump yet devised by man. If the energy of the descending rain could be used to drive our machinery, no other source of power would be required. But this is only one of the ways in which the sun's heat does work upon the earth, and the whole amount of energy which strikes the earth is many times that which is used in evaporating the water and raising it to the sky. While the amount of energy the sun pours upon the earth is appalling, the earth is so small as seen from the sun that only one part in eight billion of the energy that streams out from it strikes this little planet upon which we live.

RIGID RULES ON SWISS STREET CARS

The rigid rules laid down for passengers on the tramcars of Geneva are a good example of the thorough fashion in which restrictions are formulated in all parts of Switzerland. The notices posted in the tramcars are as follows: Do not smoke; Do not spit;

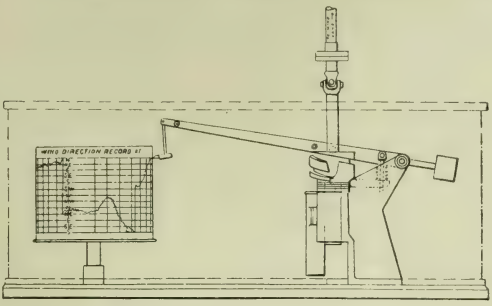
Have small change ready; Do not delay to pay your fare; Speak clearly when naming your destination; Do not move until the conductor summons you; Do not cross your legs or otherwise impede the passage.

An English correspondent says that if the conductor notices a pair of crossed legs, he comes in and uncrosses them.

INGENIOUS RECORDER OF WIND DIRECTION

A London concern has constructed a very ingenious and simple wind-direction recorder, consisting of a pen which moves in a vertical plane, and traces a recording curve on the surface of a revolving drum. The pen is driven from a cam which is connected up to and actuated by a wind vane mounted at the top of a vertical spindle. The drum is driven by self-contained clockwork.

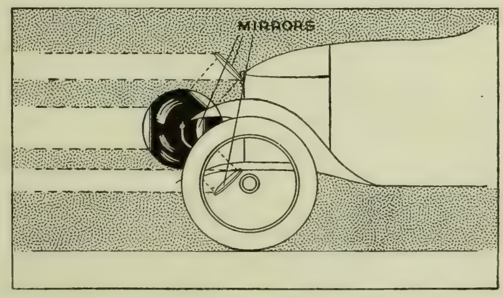
The advantage of this apparatus lies in its extreme simplicity and in the fact that the movements of the pen are vertical and the charts rectilinear. "It is obvious," says Engineering, London, "that an instrument having a simple and continuous groove in the cam could not be constructed on the lines of the figure, since with backing and veering winds, the vane, after making a complete revolution, would cause the pen to so alter its zero in reference to the chart that the readings would become meaningless. In other words, if the vane is to be free to make complete revolutions in any direction, and this is, of course, essential, there must be, at some point, a means of resetting the pen on the chart. The simple method adopted is the main point of interest in this recorder. The cam groove is in the form of a spiral, so that as the vane moves round, one way or the other, with a wind of varying direction, the pen either rises or falls on the chart. The zero adjustment is arranged for by the vertical slots at the end of the cam groove, one of which can be seen in the figure. If, owing to continuous progression in one direction, the roller or pen lever reaches one end of the spiral groove, it immediately moves through the vertical slot into the upper, or lower, part of the groove, as the case may be. The effect of this is naturally to trace a vertical line on the revolving chart, and at the same time to alter the zero of the pen. The chart has a portion of its direction scale duplicated, so that after this vertical movement the pen still indicates correctly the direction in which the wind is blowing."



A New and Extremely Simple Instrument for Recording Wind Direction. Method Adopted to Offset Backing and Veering of the Wind is Ingenious

"STREAMLINE" HEADLIGHT FOR AUTOMOBILES

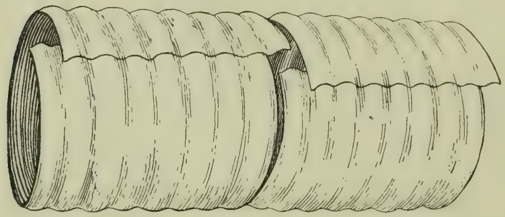
A novel, yet very efficient automobile headlight, receiving much favorable mention abroad at the present time, is shown in the accompanying drawing. It is spoken of as a "streamline" headlight, and is claimed to fully utilize every ray of light given off by the single electric bulb, which is responsible for the production of its five pow-



A New Type of Headlight Which is Practically Five Searchlights in One. The Illustration Shows Only Three of the Beams erful beams, described as five searchlights. The idea carried out is that of a single spherical body containing five powerful lenses, so disposed that each is aided by the reflecting surface of the interior of the sphere. One beam goes straight forward in the usual manner, and the other four, going rearward, are caught by exterior mirrors, and set off almost parallel to the first. And though five separate beams or searchlights are thus made available, it must not be supposed that an ordinary beam has been divided into five equal parts, giving only the same total light as the one. The outside mirrors as well as the spherical body itself are mounted on a special gate which may be swung aside so that the starting handle can be reached.

A METAL CULVERT WITH SPIRAL CORRUGATIONS

A new and interesting type of metal culvert, the corrugations of which run in a spiral, is now being manufactured by a concern in Birmingham, Ala. Greater strength than in other types of corrugated culverts is claimed, in that the spiral form allows no break in the continuity of the corrugations. One of the most interesting features is the simplicity of the joining of the 26-in. sections, which screw together as shown in the illustration, the corrugations serving as threads. The spiral corrugations are also claimed to make these culverts to a great extent self-cleaning.



Sections of Spiral-Corrugated Culverts Just Before Being Tightly Screwed Together

WHAT IS A "HIGH" AND "LOW" VOLTAGE?

When electrical energy first came into use commercially the terms "high voltage" and "low voltage" were commonly employed to distinguish between the voltage of the series arc-lamp circuit and that used in operating incandescent lamps. Voltages, in the latter case, were limited to 50, 100 or, at the most, 110 volts, while the generators supplying current to the arc-lamp circuit generated a voltage that in some cases reached 3,000 volts. The arc-light generators were gradually increased in size, and within a few years it was possible to get over 6,000 volts from one machine, which was considered at the time to be a really high voltage.

Shortly afterward the alternating-current generators came into the field, first at 1,100 and then at 2,200 volts, and it was not long before they were used in combination with step-up transformers which raised the voltage to values as high as 11,000 volts.

In recent years these voltages have been constantly increasing, and at the present time we have machines that generate 15,000 and 30,000 volts. These voltages may be increased to almost any value by means of transformers, and there are now in successful operation a number of power systems, employing transmission voltages of 60,000, 110,000 and even 140,000, a transmission line of the latter voltage having been put into operation recently in the United States. Voltages in the neighborhood of 1,000,000 volts have been produced in testing laboratories, for the purpose of testing apparatus to be used on high-voltage circuits, and the insulating material of such apparatus.

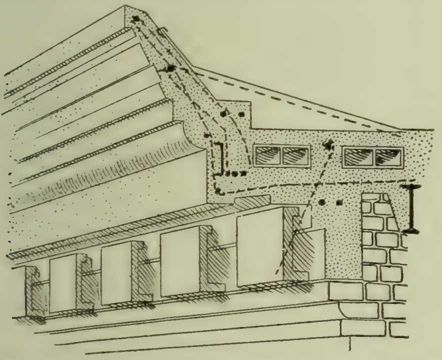
Thus, it can readily be seen that there is no distinct line of demarcation between a "high voltage" and a "low voltage," the terms simply signifying relative values; and no doubt, the highest values we have at present, will be far exceeded in the future, as the difficulties encountered in using high voltages are being gradually overcome.

INDUSTRIAL CONSUMPTION OF GOLD

The world's production of gold from 1900 to 1910 inclusive, according to estimates of Director Roberts of the U. S. Mint, was $4,037,000,000, and of this total $958,000,000 was used up in industrial consumption. The consumption of gold in the industrial arts for the year 1910 was $33,657,500 in the United States; $18,000,000 in Great Britain; $16,838,000 in France, and $15,536,000 in Germany. The United States industrial arts thus consumed nearly as much as its nearest competitors, Great Britain and France, together.

CONCRETE CORNICE OF MASSIVE SIZE

The new 10-story Y. M. C. A. building in Los Angeles, Cal., has a massive concrete cornice which is said to be satisfactory in every way. The cornice has an overhang of 4 ft. 2 in. from the outside of the wall, and is 5 ft. 6 in. from the base to the tip. The cantilever principle is applied in construction, the base of the cornice resting upon a section of the brick wall and corbels. Steel reinforcing bars extend from the concrete roof slab into the main portion of the cornice.

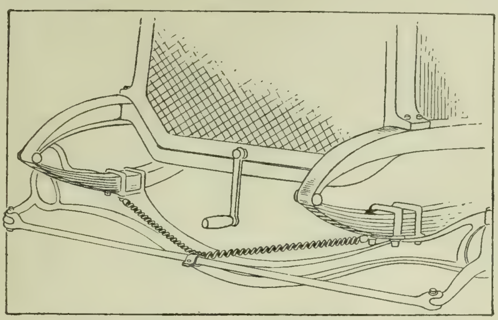


The Massive Reinforced-Concrete Cornice of the Y. M. C. A. Building in Los Angeles

The intention was to put a terra-cotta cornice on the building, but the lowest bid was $8,000. The concrete cornice cost just about half this amount.

SPRING ATTACHMENT KEEPS FRONT WHEELS STEADY

An ingenious device designed to prevent the front wheels of an automobile from being easily turned aside by obstructions or unevenness in the road, is being marketed by an eastern automobile-accessory concern. A spiral spring about 3 ft. long, made from specially prepared oil-tempered steel wire, with a center clip and end attachments made from steel forgings, is attached between the front spring seats and the steering rod. It is claimed to correct automatically any tendency of the wheels to turn aside from a straight path.



This Spring Attachment is Designed to Keep the Front Wheels Steady on Rough Roads

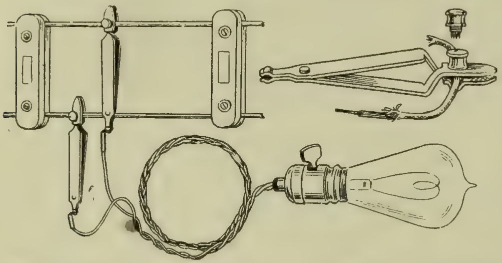
"TITANIC" MAY HAVE STRUCK ROCK

That there is a chance that the wreck of the "Titanic" may sometime be recovered, either by government searchers or by a private expedition, is the opinion of the Nautical Gazette. This is based on the theory that the giant liner did not run into an iceberg, but ran onto the point of a rock. It is pointed out that no one has set forth any specific reason, or brought out any proof that a rock does not exist at this particular spot in the ocean.

The possibility of a peak of rock existing at this place in the ocean becomes apparent to any one who studies the contour of mountains on land, says the Gazette. Peaks rise abruptly to vast heights and are surrounded by contrastingly deep valleys. It is not unnatural, when one views the geography of North America, to suppose the existence of a chain of occasional peaks rising from the ocean's bottom about as far off shore as the longitude of the "Titanic" wreck.

EMERGENCY CONNECTION CLAMP FOR WIRING

A clamp intended to facilitate emergency connection to an insulated-wire circuit without scraping or cutting away the insulation, is shown in the accompanying illustrations as used for a test connection, and also for tapping open electric-light wires when additional lighting units are desired temporarily.


The Emergency Clamp Used for a Temporary Tapping of the Wires When an Extra Lamp Connection is Desired, and as Used in a Test Connection

The device consists of a spring-steel clamp whose jaws can be quickly separated by squeezing the wide part between the thumb and forefinger. One of the jaws has a cross groove and recess for holding the wire, and on the other jaw is a screw cap from the inner side of which project a number of sharp-pointed prongs. On release of the pressure used to open the jaws, the prongs penetrate the insulation of the wire, and are driven into a firm electrical contact with the conductor itself by a little pressure of the thumb on the top of the cap.

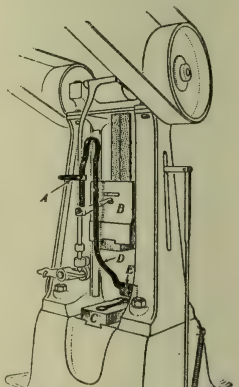
¶It is becoming the fad for fond fathers and mothers in London to have motion pictures of their children made, one photographer of the British capital, who makes a specialty of such work, turning out a film of 640 pictures for $5.25.

AN ELECTRICITY-ON-THE-FARM DEMONSTRATION

During the recent land show in New York one of the large electric manufacturing companies gave an extensive demonstration of the many things that can be done with electricity on the farm. A complete dairy was installed, the apparatus consisting of an electrically driven milking machine, individual motor-driven refrigeration machine, milk cooler, cream separator, automatic churn and butter worker, bottle washer and ice-cream freezer. Motor-driven corn shellers, feed choppers and an electrically driven sheep shearer were installed in the barn, motor-driven laundry machinery, ventilating fans, cooking equipment, and numerous other devices were to be found in the house, and outside machinery, such as a threshing machine, silo filler, centrifugal pump for irrigation and fire protection, an automatic pump for ordinary water supply, etc., were all motor driven.

SAFETY DEVICE FOR FORGE PRESSES

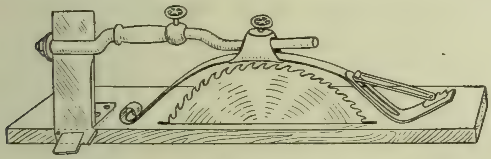
Attached to this forge press is a device for automatically preventing accidents in drop-forging shops. Drop forgings which require little machining are frequently furnished to gauge-sizes, and are therefore restruck in forging dies after the "flash" or excess metal has been removed. Through some disconcerted action, the operator, while seating the forgings in the die impression by hand, may meet with serious injury from an untimely falling of the ram, and it is to avoid such an accident that the automatic device has



been designed. It is a spring-steel device, indicated by the darker outlines in the illustration, clamped to the guide or upright at A. When the ram B descends, its contact with the device, at D, automatically forces the hand of the operator to a place of safety, C. The leather pad E modifies the force of the blow to the operator's hand.

SIMPLE GUARD FOR RIPSAWS

A neat and simple guard for ripsaws is shown in the accompanying drawing. By means of the dovetailed hitch, or bedplate, which is attached to the table permanently, the guard proper can easily be attached and detached without having to get under the table to loosen nuts and bolts. The device can be attached to saw-table tops of either wood or iron. It is adjustable to any size of saw from 6 up to 16 in. The adjustment is accomplished by drawing out or shoving up the two independent springs, and raising or lowering the arm on the splitter.

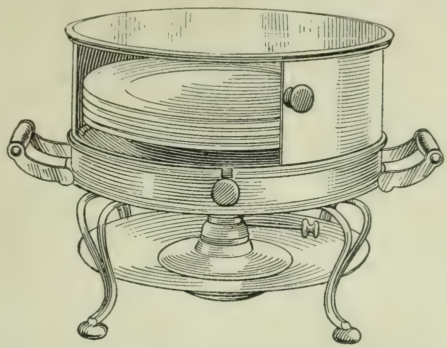

A Simple and Practical Guard for Ripsaws

LIBRARY BRANCH INSTALLED IN HOTEL

A public library innovation recently inaugurated in Minneapolis would seem, on the face of it, to be worthy of imitation in many other cities. As the result of arrangements made with the library board by the management of one of the leading hotels, a branch of the library has been installed in the hotel, where its guests can obtain books and current magazines. The equipment of the branch is such as to give it the appearance of a private library.

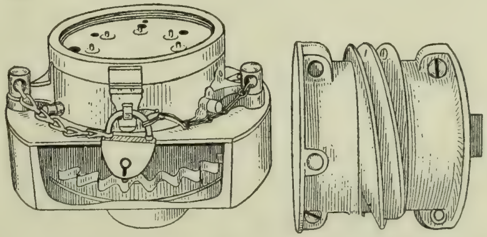
DISH WARMER FOR USE ON THE TABLE

The hot-plate cozy shown in the accompanying drawing is a novelty that has gained much popularity in England. It may be placed on a dining or serving table in the same manner as a chafing dish and takes up no more room. The same type of dish warmer may be provided with electric heat instead of the alcohol burner shown.


An Alcohol-Heated Dish Warmer for Table Use

REVOLUTION RECORDER FOR MOTORBOATS

The International Motorboat Association sometime ago adopted the Swedish scheme of providing boats, taking part in races, with a propeller-revolution recorder. The recorder shown in the illustration, which is of Swedish manufacture, consists of two parts, one of which, the worm, is directly connected to the propeller shaft, and drives the second part, which is the calculating mechanism. The latter can be located at any convenient place in the boat.


Propeller-Revolution Recorder for Racing Motorboats

EXHALED AIR IS A VIRULENT POISON

By LEONARD K. HIRSHBERG, A. B., M. D.

Although the ancient Egyptian physicians as well as Hippocrates and Galen recognized the importance of sea voyages and fresh air, it was only within the past quarter of a century that plenty of oxygen was realized to be an absolute necessity in the treatment of such pulmonary diseases as bronchitis, pneumonia, and tuberculosis. A pure atmosphere surrounding the sufferer, is now emphasized really more than drugs and other measures. It is considered as important to have the window in the sickroom open wide enough to throw a piano out, as it is to have plenty of water for fever maladies.

Although we have long considered pure air and free ventilation requisites to health, and while we have not minimized the cumulative and disastrous results of inhaling expired air, the true explanation of this damaging effect has not previously been given. The sad consequences of living in an atmosphere charged with the waste products of our lungs have always been declared due to vitiated carbonic acid, and absence of oxygen. Humidity, increased temperature, and similar doubtful factors, have been the inferential goats.

Attempts hitherto made to isolate from air breathed out of our lungs, specific toxins, injurious compounds, poisonous chemicals, and proteins supposed to cause suffocation, anæmia, and other maladies, have been hopeless failures. Whether an animal was allowed to live in and breathe the exhalations of man or other animals, or whether such expiratory blasts were inoculated directly into the animal's blood vessels, no satisfactory conclusions could be drawn.

True enough, it was finally and for all time determined by dozens of skilled bacteriologists, that all sputtered, coughed, and sneezed mucus, as well as the particles of mouth and nasal fluids scattered in talking, carried large numbers of disease-producing bacteria in the accompanying spray. But this dangerous method of spreading infectious diseases could not clear away the fact that expired air, even though aseptic—free of microbes—destroyed life.

Prof. M. J. Rosenau, of Harvard University, formerly of the Bureau of Hygiene of the United States Department of Agriculture, who has made so many other important discoveries relating to preventive medicine, has offered the first logical proof in support of a reasonable explanation of why expired air is poisonous to those who breathe it.

This investigator was the first scientist in this country to explain why some animals exhibit a strange sensitiveness to certain foods or serums. He named this condition, "anaphylaxis" or "hypersusceptibility." When a guinea pig is inoculated with human blood the first time, nothing may happen. It is now said to be "hypersusceptible." If, after several weeks, another injection of the same kind of blood be given to the same animal, it will become very ill and may die.

This suggested to scientists that hay fever might be due to hypersusceptibility to plant protein, hives to hypersusceptibility to tomatoes, berries, fish, or shellfish proteins, and one variety of asthma as due to hypersusceptibility to horse serum.

Professor Rosenau has taken various amounts of expired air, and inoculated it into guinea pigs. After ten days, a second injection caused the animal to die. He proved to the scientific world that the expired air of animals, contains a definite organic protein, which when inoculated into animals, makes them dangerously susceptible to a second injection from the original animals that exhaled the air.

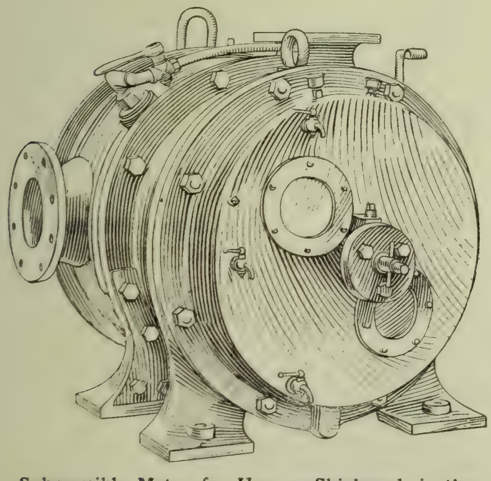
Professor Rosenau's acknowledged

standing in the scientific world makes his startling results doubly assured of a hearing. He says: "In condensing the vapors from the expired breath of man, injecting the liquid so obtained into guinea pigs, and, after an interval of several weeks or more, testing them to see whether they have become hypersusceptible to normal blood, positive reactions were obtained in a large number of cases."

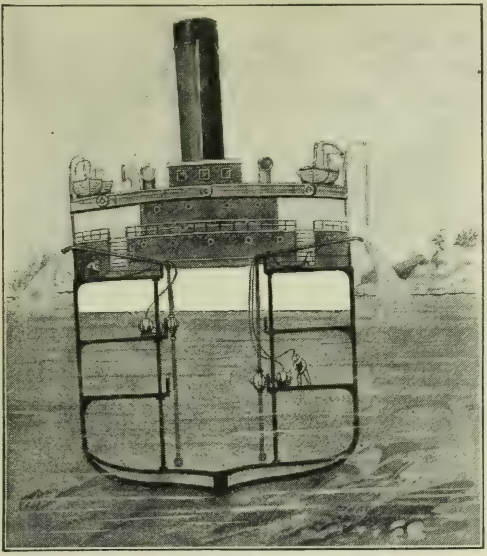
This, if verified by other investigators, will disprove the popular notion that bad ventilation, impure air in churches, close theaters, and other crowded gathering places, and living rooms, signify only carbonic acid, or absence of oxygen.

SUBMERSIBLE ELECTRIC MOTORS

The submersible electric motor, developed in England, is designed especially for use on shipboard, for the salvage of ships, and in mines. It is claimed to be particularly practical for use on decks exposed to breaking seas, in the operation of boat hoists, winches, capstans, etc. Further, in the salvage of a ship, the submersible motors and pumps can be lowered down to any deck below water, where, in the event of bad weather coming on, they would not be in danger of being torn away and washed overboard.



Submersible Motor for Use on Shipboard, in the Salvage of Vessels, and in Mines



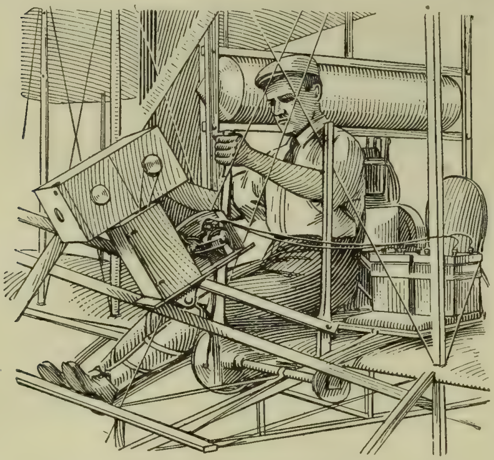
Submersible Motors in the Water-Filled Hold of a Ship

It is also claimed that the submersible motor is well adapted for use in mines in the operation of coal-cutting machines. With the motor and the switches controlling the cutting gear immersed in a tank of water, the tank being covered to keep out the coal dust, and the whole arrangement placed on a trolley, there would not be the slightest danger of explosions caused by electric sparks.

MOTION-PICTURE CAMERA FOR AEROPLANES

In an illustration on the following page is shown the automatic motion-picture camera used by Frank T. Coffyn in taking motion-picture photographs from his aeroplane.

All the operator has to do is to open or close a switch to stop or start the taking of pictures, the camera shutter and the reeling mechanism being operated by two $\frac{1}{12}$-hp., 6-volt electric motors, which receive power from two storage batteries fastened to the passenger's seat next to the engine. The boxes shown at the top of the apparatus contain the film, the unexposed film being reeled off in front of the lens from one box and wound up again in the other. The motor speed is 1,800 revolutions per minute, and the gear reduction to the camera is 14 to 1, giving a speed of 128 revolutions per minute.



A Motion-Picture Camera Especially Arranged for Aeroplanes

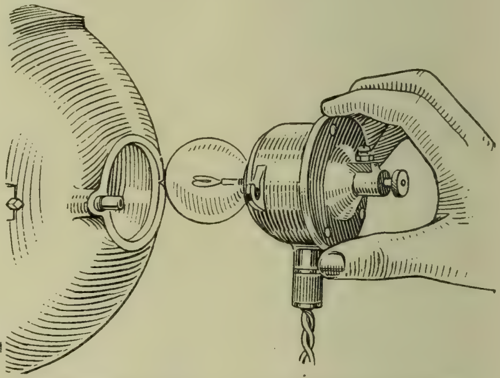
The ease with which the apparatus can be operated by the airman without distracting his attention from the proper control of the aeroplane, is said to make it ideal for aerial motion-picture work.

WATER POLLUTION TESTED BY ELECTRICITY

In a water-testing device, recently brought out, use is made of the conductive properties of water, containing different impurities, in determining the amount of impurities present. A chart is first made showing the relation between the impurities present, as determined by chemical analysis, and the electric-conductivity measurements. Subsequent conductivity measurements may then be used in finding, with a reasonable degree of accuracy, the degree of pollution. These conductivity measurements do not, however, discriminate between one kind of impurity in the water and another; chemical analysis alone can do that. In the majority of cases, in engineering work, the impurities present are known, having been previously determined by analysis, and later tests are not made for purposes of analysis, but only to find out how much of the known substance is present in the water; and in all such cases the tester gives the desired result with a rapidity and simplicity far exceeding that of any chemical test.

HEADLIGHT CAN BE USED AS TROUBLE-FINDER

A new combination automobile headlight and "trouble-finder" has been brought out by a Milwaukee manufacturer. The headlight, which is shown in the illustration herewith, is made of a silver-aluminum casting about $\frac{3}{16}$ in. in thickness, with the interior ground to a high mirror-like polish. By giving the socket at the rear of the lamp a slight turn to the left the bulb is removed so that the light may be used as a portable lamp for hunting trouble around the motor or other parts of the car. With the socket thus removed, bulbs of various candlepowers may be used as required in city streets or on country roads.



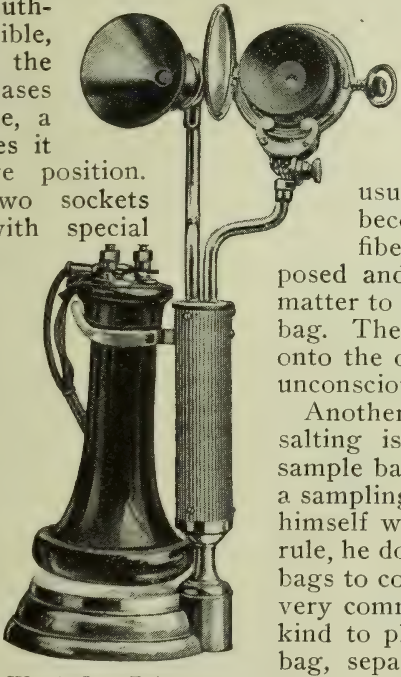
Headlight Which may be Detached and Used about Car

ℭCoal, bearing gold assaying $2 per ton, has been discovered at Cambria, Wyoming, the roof of the coal bed having been found to be formed of alluvial sands washed down on the coal in a former age.

WATCH-CASE TELEPHONE TRANSMITTER

A sanitary vest-pocket telephone transmitter, the purpose of which is to provide any individual who desires with his own transmitter for use in connection with a public telephone, is shown in the accompanying illustration. Its use, however, would require that all public telephone instruments be equipped with extra terminals.

The vest-pocket transmitter, including the watch-casing, is but 1 in. in diameter. The mouthpiece is collapsible, and, on pressing the button which releases the lid of the case, a spiral spring pushes it out into operative position. The case has two sockets which connect with special terminals on the stationary telephone instrument or the desk stand. In making this connection the regular transmitter is automatically shut out of the circuit. The illustration shows the transmitter attached to a desk phone equipped with the necessary terminals for its use.


Watch-Case Telephone Transmitter Attached to Special Desk Phone

INNOCENT "SALTING" OF ORES

Back in the days when the prospectors tramped through the gold regions seeking the fortune-laden veins, "salting" was a term that gave the idea that some dishonest man was endeavoring to profit by creating a false impression as to the value of his property, but, as explained in the Mining and Engineering World, there are a great many cases in which the criminal motive is entirely lacking. Ignorance and carelessness are responsible for the salting.

One of the common cases cited is the use of coin bags, such as are commonly used by the mints and subtreasuries and banks for the transportation of coin. Very few other than public assayers realize to what extent these bags are used as containers for samples. If anyone will take the trouble to closely examine a freshly minted coin under a microscope, he will readily appreciate how it happens that bags used to convey coins are capable of yielding so much abraded gold. The edges are extremely sharp and rough and the fine particles of gold found in the bags as the result of the rubbing together of the coins are usually of such shape that they become entangled in the cotton fibers of which the bag is composed and it is an extremely difficult matter to dislodge them by shaking the bag. The result is that the gold works onto the ore sample and the sample is unconsciously salted.

Another explanation of the innocent salting is found in the shortage of sample bags. An engineer starting on a sampling trip does not care to burden himself with extra equipment, so, as a rule, he does not take with him enough bags to contain all his samples. It is a very common practice in a case of this kind to place two samples in a single bag, separating them by means of a piece of string tied about the middle of the bag. If the samples are removed at each end, allowing the string in the middle of the bag to remain in place during the operation, salting will not occur; but if, as is usually the case, the top sample is removed and then the string is untied and the second sample dumped out, salting may take place.

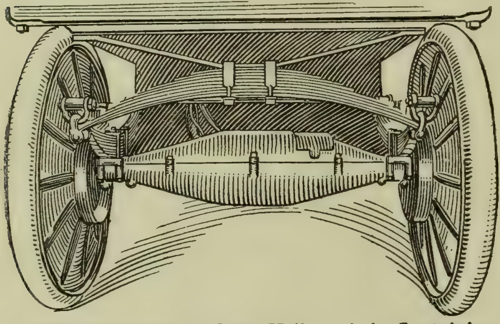
The use of porous and inferior grades of sacks is another very common cause for salting. It frequently happens that the "fines" are the most valuable part of the sample, and if the container has loose texture, a more or less important loss of the fine material is bound to take place. Not only is there danger in a case of this kind of the "fines" being lost altogether, but there is equal danger of the fine material of one bag finding its way into another bag.

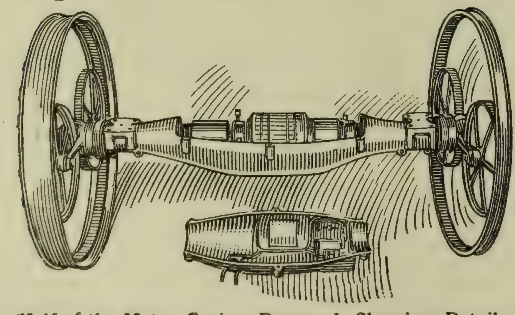
Again, the use of canvas for catching samples after they have been broken down has been the cause of many cases of innocent salting. Canvas has a tendency to retain "metallics" and fine sulphides and to yield them up at the wrong time and place.

Contaminated tools are sometimes the cause of salting. In picking down a rich gouge, any kind of sticky high-grade material, there is a tendency for some of the ore to cling to the point of the pick, and if the tool is afterward used on a low-grade material without being cleaned, salting will almost invariably occur.

The innocent salting of samples is not confined to those who take them, for in the laboratory in which the samples are assayed are found many instances. The retention of gold on the face of the grinder is another point deserving mention, and too few assayers have given this matter the attention it deserves.

ELECTRIC MOTOR CARS WITH MOTOR IN HOLLOW AXLE


Exterior Appearance of the Hollow Axle Containing the Motor

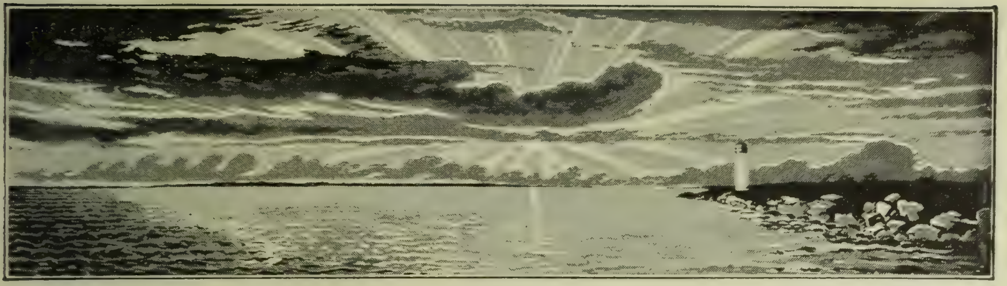

Half of the Motor Casing Removed, Showing Details of the Arrangement

An electric car having a balanced-drive power plant inclosed in its hollow rear axle, the wheels being driven by means of an idler and rim gear, turned by the pinions of the motor's shafts, is shown in the accompanying illustrations. The power from the single motor housed in the hollow axle is transmitted through the direct-connected differential and the drive shafts to each rear wheel, the drive-shaft pinions transmitting the power through the idler gears to the large rim gears fastened to the tire rims of the wheels. In this way the power is claimed to be transmitted in the most direct and efficient manner to the place where it is used, that is, the tires of the wheels. The drive pinions and shafts have no bearing except the teeth of the idler gears, between which the pinions float in a balanced manner.

CONCRETE REFRIGERATORS

Concrete refrigerators of pleasing appearance are being manufactured by a concern in Indianapolis, Ind. The framework is a steel skeleton, which is covered with wire netting, plastered inside and out with cement, and given a coating of hard white enamel. About three weeks are required for the setting of the walls, after which the waterproofing is applied, followed by two coats of cement enamel.

ℭA Japanese steamship line is to be established between Yokohama and New York as soon as the Panama Canal is completed, 11 steamers having been contracted for by the projectors of the enterprise, which is to be run under a government subsidy.



The Wonders of Light

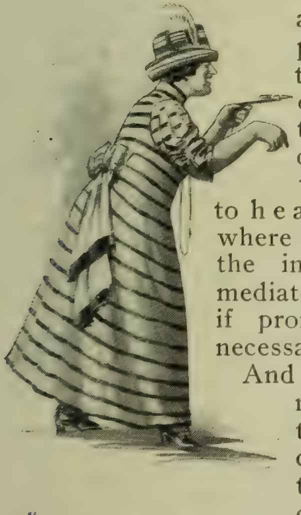
By J. GORDON OGDEN, Ph. D.

VI—The Illusions of the Eye

This is the sixth of a series of articles by the author of "Heat" and "The Kingdom of Dust," which have appeared in this Magazine. Dr. Ogden is professor of physics in the Fifth Avenue High School, Pittsburg, Pa.

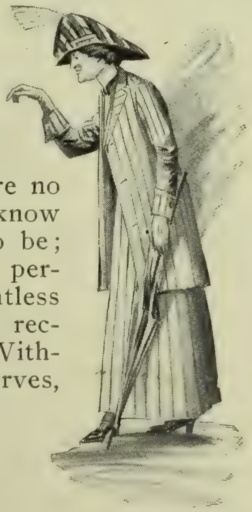
WE are dependent upon our senses for our knowledge of all things external. We see, hear, smell, taste and feel through the agency of tiny little threads called nerves. The brain is the editorial sanctum, and the nerves are the special reporters, whose business it is to bring news from the outside world.

Throughout the human system is a complicated network of nerves, extending to the remotest frontiers of the body, and the news service thus afforded is unexcelled for accuracy and speed. As soon as any bit of information comes to any of these reporters, it is telegraphed at once, sometimes to a relay office, sometimes directly to headquarters, where it is edited and the information immediately acted upon, if prompt action is necessary.



"A very stout lady would do well to avoid horizontal stripes in selecting her dress goods."

And yet, so far as news interpretation is concerned, the editorial system is often at fault. It is a common mistake, made by practically everyone, to attribute to the external world properties that are peculiar to the brain. For example, we associate the sound of a bell with the bell itself. We think that the green of a beautiful lawn is a property of the grass. That the perfume of a rose is the individual, private possession of the flower. That sugar, likewise, has the inherent quality which we call sweetness, and that salt and quinine possess the peculiar tastes we always associate with these substances. This is where the editorial system of the body is at fault. From the editor-in-chief, down to the humblest cub reporter, credit is not given where credit is due. If there were no eyes, light, as we know it, would cease to be; and with it would perish all its countless children which we recognize as colors. Without auditory nerves, there would be absolutely no sound in the universe, and the wonderful harmonies of nature, as typified in the sighing of



"A tall lathlike individual should refrain from perpendicular lines in her costume."

the wind, the thunder of the surf, the melodious flutings of the feathered

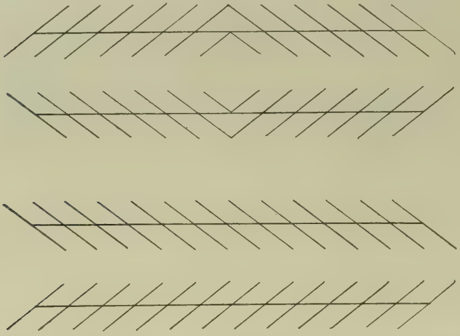


Fig. 1—Zollner's Lines: The Long Lines are Parallel

songsters, as well as the stately measures of the "Largo," would be forever beyond our ken.

Light and sound, externally, are simply forms of vibratory energy which knock at the several gateways to the brain, and are admitted under a false conception of their real nature. We do not give to the brain its proper credit. Light waves, as we have shown in a former article, are simply quiverings of the mysterious ocean of ether.

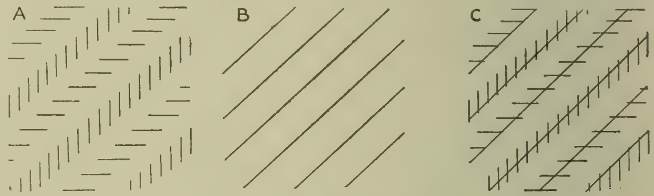


Fig. 3—Zollner's Lines: A Combined with B Produces the Peculiar Effect of C

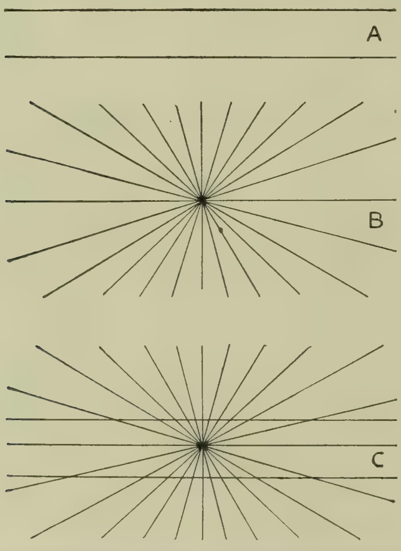


Fig. 2—Placing A upon B Produces the Curious Effect Shown at C

These tremulous, delicate little disturbances, in some obscure manner, give rise to the sensation of light and color in the brain. It is just as improper to attribute the phenomena of light and color to these tiny waves, as it would be to assert that the little pellet of lead, flying from a gun, is pain, simply because it produces pain when it crashes into the delicate tissues of the body.

Light and color, sound and odor, taste and touch, are brain-made. It is the consciousness that sits at the end of the telegraph wire that interprets the little electric thrills into messages of hope or despair, of joy or sorrow. Without the operator what would a telegram be? Simply a quivering, a motion as material as the swaying to and fro of a pendulum.

A curious corollary follows from this truth. As a matter of fact we do not know just what any other person feels. We are like solitary islands in a vast ocean. We do our own perceiving, and there is no possible way by which we can come to a knowledge of what anyone else perceives. We agree in saying that "the rose is red, the violet's blue," and further declare that "sugar is sweet," but there we stop. Just what red, or blue, or sweetness is to anyone else we are unable to say. If we could exchange bodies we might know; but even then it is quite probable, if such a thing could be, that we would be compelled to learn the simplest facts all over again, and to readjust the relationships between the phenomena and the names by which we have been accustomed to distinguish them. Possibly the impression produced in one brain by the beautiful blending of colors in a sunset may impress another brain in an entirely different way. Possibly the "Apassionata" of Beethoven may affect us as a Turner landscape affects someone else. To repeat, we do not know what any other person feels.

It is partly this peculiar state of affairs that is responsible for what are known as illusions. All the senses may be readily deceived. If we roll a marble under crossed fingers, we are quite certain, so far as feeling is concerned, that there are two marbles. We are often unable to tell from which direction a sound comes. A moderately warm room seems cold to one who has just come from a very hot kitchen, while the same room seems to be quite warm to one who has just come in from the street where the temperature is hovering around zero. It is the eye, however, and the sense of sight, which are peculiarly prolific in the matter of illusions. We really see two images of everything we look at. Close one eye, and we are unable to calculate distances. Let us accustom ourselves to the atmospheric conditions of one locality, say in New York, then attempt to estimate distances in Denver, and ludicrous mistakes follow.

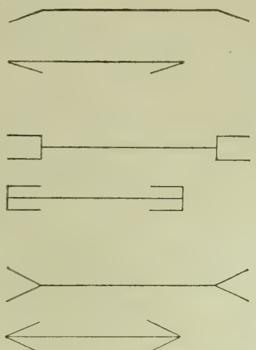


Fig. 4—The Long Horizontal Lines are All Equal in Length

The cause of optical illusions is psychological rather than physical, and, strictly speaking, it is the "wonders of the mind" rather than the "wonders of light" that produce them. We are creatures of habit, and accustom ourselves to judge light phenomena in a certain definite manner. Should these phenomena present themselves in a novel manner, we are all at sea immediately, and permit our attention to wander, or allow our judgment to be warped.

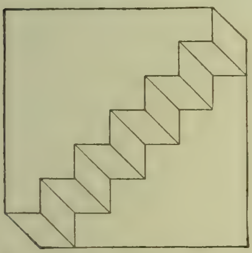


Fig. 5—The "Staircase" Illusion: Do You See It from Above or from Underneath?

Figures 1, 2 and 3 may be termed illusions of vision through distributed attention. Ordinarily it is easy for us to recognize parallel lines when we give our whole attention to the problem. When, however, we allow our concentration of mind to be led away by some distracting influence, like the short, transverse lines in the illustrations, we easily fall into the trap, and are quite certain that the long lines are not parallel, or, as in Fig. 4, that the lines are of unequal length. Figure 5, the familiar "staircase" illusion, is really not an illusion according to the psychologists, but an example of what has been termed an "equivocal" drawing, and that the staircase from underneath is as true a perception of lines, as is the staircase from above. At any rate it has all the earmarks of an optical illusion, however the psychologists may choose to explain it.

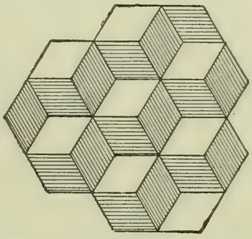


Fig. 6—The "Block" Illusion: Do You See Six, or Seven, Blocks?

The familiar "block" illusion shown in Fig. 6, giving the perception of six cubes, or seven cubes, depending upon some peculiarity of mental processes, is also interesting in this connection.

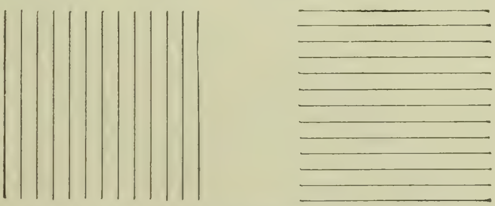


Fig. 7—Each of the Series of Lines Covers the Same Space

Figure 7 shows a series of vertical and horizontal lines. In both drawings the same space is covered. Advantage is taken of this curious illusion to give height to a room by the use of proper wall paper. Likewise, a very stout lady would do well to avoid horizontal stripes in her dress goods, unless she wishes her stoutness to be exaggerated; while a tall, lathlike individual would show good taste in refraining from perpendicular lines in her costume.

Figure 8 will cause most of the readers of this chapter to look for their rulers or tapelines. It hardly seems possible that the vertical line is not longer than the horizontal line—yet it is the same length. In Fig. 9, the line outside the square is the exact length of the diagonal of the square.

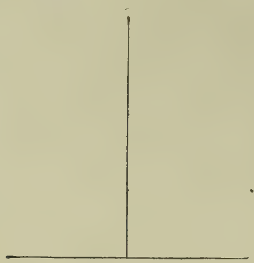


Fig. 8—The Vertical Line is Precisely the Length of the Horizontal Line

Figure 10 is an illusion of distance. When one looks at the left-hand divisions, made up of lines close together, the mind attends to these closely, and establishes a unit of measurement. When the attention is turned to the wide empty space to the right of the series of lines, immediately a larger unit is applied, and the sixth or last line of the series does not seem to be what it really is, the center of the figure.

One of the most curious illusions is that presented in Fig. 11. It is an illusion of motion. Hold the drawing vertically before the eyes, and move it slowly up and down. The oblique line will appear to slide up and down on the vertical line, as though it were not attached to it at all. Psychologists tell us that this phenomenon is due to the fact that the mind underestimates the speed at which the drawing is moved. It is a good example of the instability of a mental standard. It is almost impossible for the mind to form and adhere to a standard that will not vary. One might as well attempt to measure with outstretched arms the width of a door, and carry the measurement through a crowded street to the nearest carpenter's shop.

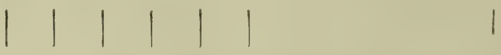


Fig. 10—The Space at the Right is Equal to the Space Covered by the Six Lines at the Left

An illusion that is responsible for the employment of at least a hundred thousand people, the investment of millions of dollars, and the amusement of everyone, from the graybeard to the urchins of the street, is based on the fact that an impression made upon the retina remains there for an appreciable time. We are familiar with the old experiment of rapidly revolving, in the dark, a stick with a glowing end, and the consequent production of a ring of fire. Of course, no ring is produced, but the illusion is perfect.

An impression made upon the retina by a strong light persists for a tenth of a second, sometimes longer. If a series of swiftly moving pictures be projected upon a screen by a stereopticon, the eye retains the impression of each picture in the series for at least the tenth of a second. If there be more than ten pictures to the second, the images gradually overlap and melt together, blending perfectly into a continuous picture where the slight movements made in each of the component pictures are added, making complete the illusion of continuous motion.

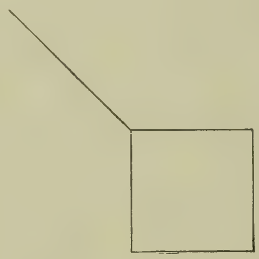
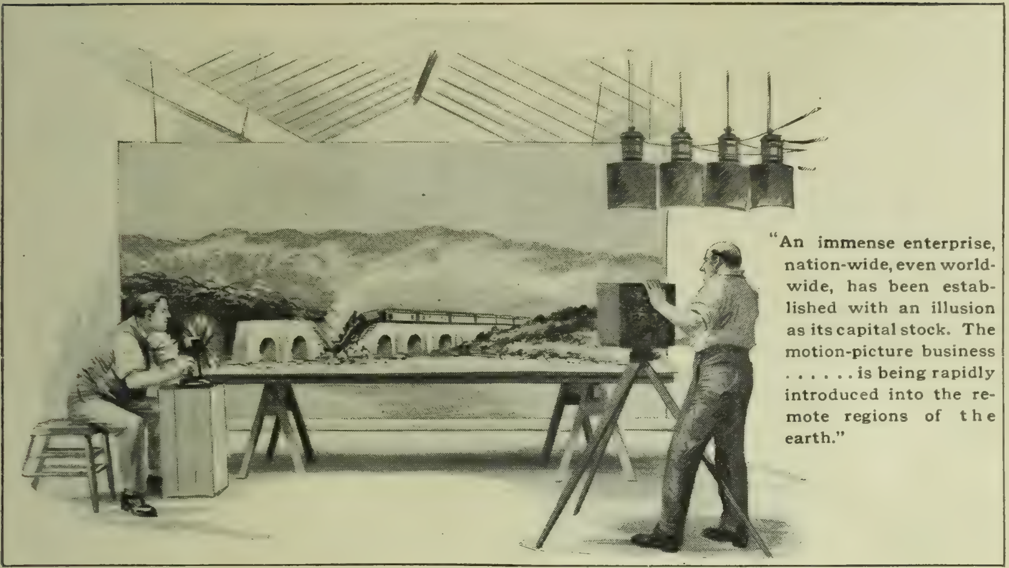


Fig. 9—The Line Outside the Square is the Exact Length of the Diagonal of the Square

An immense enterprise, nation-wide, even world-wide, has thus been established with an illusion as its capital stock. The moving-picture business has invaded every civilized country in the world. It is also being rapidly introduced into the remoter regions of the earth, where men and women are more primitive in their sociological ideas, but enjoy equally with their better educated brothers and sisters, the moving scenes "by field and flood."

The films are made of celluloid wound in reels that average 1,000 ft. in length. Each tiny picture measures 1 by ¾



"An immense enterprise, nation-wide, even world-wide, has been established with an illusion as its capital stock. The motion-picture business . . . . . . is being rapidly introduced into the remote regions of the earth."

in., and in an ordinary reel there are about 17,000 of them. They are run through the machine quite rapidly, about 16 to the second, thus consuming about 16 to 18 minutes for the average reel. Occasionally, when the proprietor of the show is anxious to clear the hall to make room for more nickels, the reels are run through much more rapidly, thus producing a peculiarly disagreeable, jerky effect. The introduction of a carefully adjusted revolving shutter in front of the lens, or elsewhere, does away with the "flicker" that otherwise would mar the smoothness of the picture, and which was so marked in the earlier machines.

Enormous sums are spent in the production of films delineating battle scenes and historical pageants. The "Crusader" film, a reproduction of certain historical scenes of the Middle Ages, is said to have cost its producers $100,000. It took two years to photograph the scenes in all parts of Europe, and upward of 3,000 people posed before the camera. One film company is reported to pay $7,000 a week royalty on just one patent. High-priced stock companies are employed, whose sole business is to perform "motion plays" in front of the camera. Copies of these films are sent broadcast over the world, and millions of people—5,000,000 daily—are entertained and instructed by them.

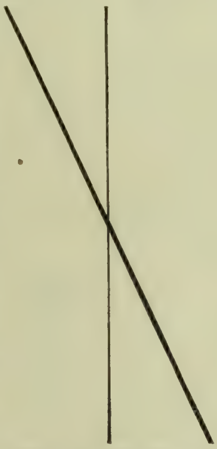


Fig. 11—An Illusion of Motion: Hold the Book Vertically in Front of the Eye at the Distance of Best Vision and Move It Up and Down. The Transverse Line Will Appear to Slide Up and Down the Vertical Line

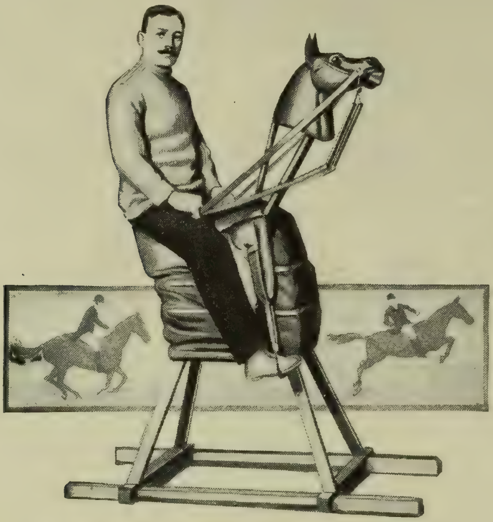
There are 30,000 moving-picture theaters in the United States alone. It is asserted that the people of this country spend $500,000,000 annually for this form of amusement—a sum greater than the yearly volume of business of the Standard Oil Company.

And all this based on an optical illusion!

¶A recent invention adopted by the electric company of Strassburg, Germany, is an electric transformer by means of which the lighting current may be used to operate the ordinary electric call bells, thus doing away with the necessity of stationary batteries in each house.

MECHANICAL-HORSE EXERCISER

A mechanical-horse exerciser, designed for the home or the gymnasium, and meeting with considerable favor in England, is here illustrated. The part of the machine representing the body of the horse is of spring-extended bellows construction. The person exercising climbs upon the mechanical horse, places his feet in the stirrups, and starts the ride, the springiness of the bellows-like body providing a rising and falling motion similar to actual horseback riding.



The Mechanical-Horse Exerciser of the Royal Automobile Club, London

SMALL MOTORBOAT TOWS A WHALE

A motor fishing dory, equipped with a 6-hp. engine, is here shown towing a whale into Eastport, Me. The whale was captured by Indians of the Passamaquoddy tribe, who live in the village of Pleasant Point on the St. Croix River, which is the eastern boundary between Maine and New Brunswick. The whale was 61 ft. long, with a circumference of 31 ft.

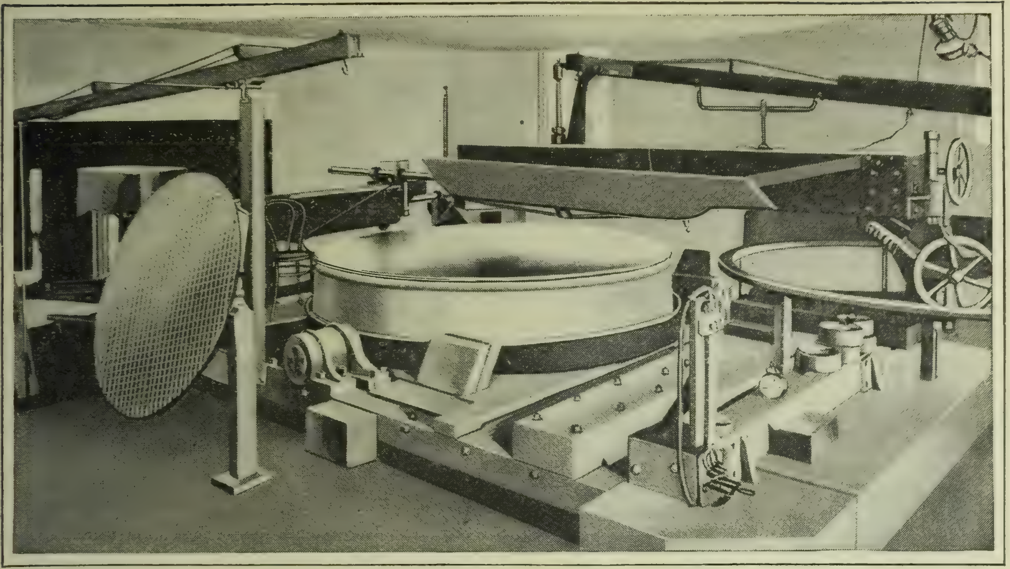
GRINDING A ONE-HUNDRED-INCH GLASS DISK

Because of the difficulty experienced by a French glass concern in producing a thick disk with a diameter of 100 in., free from air bubbles and flaws, for the reflecting telescope now in course of construction at the Mount Wilson Observatory, California, it was deemed advisable, about 18 months ago, to begin work anew upon a disk already received but rejected and laid aside.

An inspection of this disk had shown that while there were well defined sheets of air bubbles running through the body of the glass, they were located so deeply in the glass as not to interfere with securing a perfectly paraboloidal surface. Furthermore, the glass as a whole seemed to be very firmly knit together, in spite of the presence of the bubbles. Under these conditions the only obstacle to the perfect success of the disk as an astronomical mirror would lie in the presence of strains in the glass which would prevent it from maintaining its shape under different conditions of temperature.

The process of shaping the disk was therefore commenced, the work being carried on in Pasadena. At the present time the fine grinding of the spherical surface has been completed, and as soon as the polishing is finished a series of tests will be made to determine if the surface retains a true curvature at different temperatures. So far

Towing a 61-Ft. Whale into Port with a 6-Hp. Motorboat



The 100-In. Glass Disk for the 100-In. Reflecting Telescope of the Mount Wilson Observatory, on the Grinding Machine, Ready for Polishing

as is possible to judge, no changes have taken place in the flaws during the severe pressure put upon the disk by the process of rough grinding. The illustration shows the disk on the grinding machine, ready for polishing.

In the meantime the French company is continuing the attempt to cast a disk free from flaws and air bubbles. The chief difficulty encountered in recent trials has been that of annealing in such a way as to keep the temperature of the entire body of glass uniform. Owing to this difficulty a second disk, cast early last year, broke in the annealing oven.

FIRST NURSE OF INFANT TELEGRAPH

Residing in the city of Washington, D. C., is an old gentleman, now in his eightieth year, who may be said to have been the first nurse of the infant electric telegraph. His name is Alfred G. Hall, and his age sits lightly upon him when, with the memory of his early experiences still clear in his mind, he tells some incident of those early days "when we considered it a marvelous feat that we had gotten our telegraph line working all right over the tremendous distance between Washington and Philadelphia."

Mr. Hall was born in Maine in 1831. He went to Washington in 1847.

"It was just about the time of the birth of the telegraph," he said. "My brother-in-law, Mr. Donaldson, who was an instrument maker, was a close personal friend of Morse; indeed he made the first working telegraph instrument for him. Through him I became interested in the new invention and thus became the first manager of the first telegraph office established at Washington for business in the country. This position I held until 1852.

"In 1852 the line had been extended in working order as far as Philadelphia. The president of the company operated the Philadelphia key while I handled the one here in Washington, being manager, operator and pretty much everything else around the office. In those easy-going days we always closed the office at 10 o'clock in the evening and nothing could get over the wire after that; night service was undreamed of.

"The telegraphic news for the papers was gathered in the most haphazard way; rather, it was not gathered at all. Anybody who thought he had anything worth printing for the Baltimore or Philadelphia papers, would drop in casually and lay his copy on the table. The Associated Press was of course a thing far in the future.

"One day some extra-careful reader of a Philadelphia morning paper, after close examination, discovered that there was no telegraphic news in the sheet. Of course that meant Washington news. The president called me up and asked if there had been turned in by anybody the day before, anything in the way of press news at the Washington office. On examination I found that a small batch of stuff had been handed the office boy during the day, but he had forgotten about it, and I, the operator, had overlooked the matter when closing business that evening—such a negligible quantity was the telegraphic service of the press in those days.

"Somehow the oversight irritated the president and there resulted a heated discussion over the wire between the president at the Philadelphia key and the Washington force at the other end, the conclusion being that the entire Washington force—myself—put on his hat and walked out of the office. But it didn't disturb the business of the country much, then, this sudden cessation of business."

Mr. Hall was succeeded by his twin brother, and thus was enabled to keep as closely in touch with the development of the telegraph as before. He mentions an odd rule that for years was in force in all telegraph offices throughout the country.

" The operator took the messages from a roll of paper tape, like that used by the stock tickers of today. On these were inscribed the Morse characters. As the operators became more proficient they found that they could read by the sound of the click, and so, instead of laboriously spelling out the record on the tape, they transcribed it at once into English on a sheet of paper. This was the unpardonable sin in the eyes of the management and any operator detected taking a message by sound was immediately dismissed. It was thought that no man could possibly read by sound with any degree of accuracy. Today such a thing as reading from the tape is practically unknown."

Mr. Hall is the only surviving delegate to the Convention that nominated Abraham Lincoln in 1860, and sent the first message announcing it.

"There was a single key and one lone operator in the Wigwam at Chicago where the convention was held," he said. "Of course I got acquainted with the operator, and, when Lincoln's nomination was announced, I went at once to the key, and clicked the news to my brother in Washington. It was nearly an hour before another message was sent; for, what with the excitement and cheering, even the operator employed there forgot that the outside world was waiting the news.

"My brother took my telegram to Mr. Wallach, the editor of the Washington Star, which was just ready to go to press; the latter was skeptical about the correctness of the information and the paper was held back more than half an hour before the editor concluded to 'take a long chance' and print the news."

And this was barely 50 years ago!

"The skepticism with which the general public regarded the telegraph in those days seems quite amusing now," continued Mr. Hall. "Even after we had been in operation for some years, business men were afraid to intrust any important matter to what they considered such a wholly uncertain means of transmission. Prophecies were freely made that the telegraph was but a fad, a toy, that would soon pass away, like a fashion in woman's dress. The result was that for a decade, investments in telegraph enterprises were almost uniformly disastrous. One company after another started up only to go into bankruptcy for lack of business.

It was only after the Western Union, getting on its feet, began to absorb the numerous little lines that had failed, that real stability, as a permanent factor in the business of the country, was acquired by the telegraph."

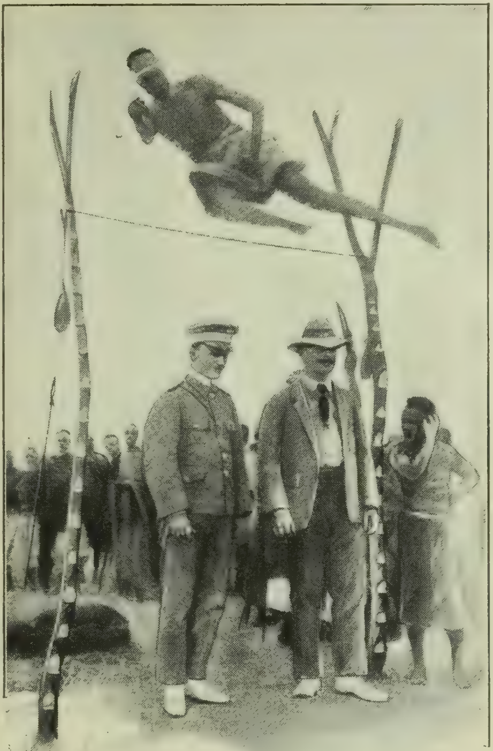
GOLF BALLS ARE IMPROVED BY TREATMENT

Golf balls with cores free from the danger of deterioration are promised in a recent improvement in their manufacture. For the purpose of increasing the resiliency of the balls the vulcanized-rubber center has heretofore commonly been soaked in a certain chemical, but when rubber tape or thread is used as the incasing material for the center, the prolonged contact between this chemical and the incasing material softens the latter, thereby impairing the state of tension in which it has been wound. The result is, on the one hand, that the resiliency of the center is reduced and, on the other, that the elasticity and tensile strength of the overlying tape is lessened. By treating the rubber center with chloroform it is claimed these disadvantages may be overcome.

AFRICA HAS GREATEST HIGH JUMPER

The feats of Olympic holders of world records in high jumping are placed in the shade when compared with the wonderful high jumps made by the long-limbed Watussi of German East Africa. They are a tall well-made people, with an almost ideal physique. Men 7 ft. 2½ in. tall are not uncommon, yet they are perfectly proportioned. The shoulders are generally powerfully built, yet the waist is at times extraordinarily slender, the hands are elegant and delicate in form, and the wrists of almost feminine grace.

Among these men have been developed the finest jumpers in the world. The best jumpers have attained heights of over 8 ft., the champion jumper, who is shown in the accompanying illustration, making a jump of 8 ft. 5 in. in an exhibition for the entertainment of the Duke of Mecklenburg, author of a volume entitled "In the Heart of Africa."



From "In the Heart of Africa;" Cassel & Co.

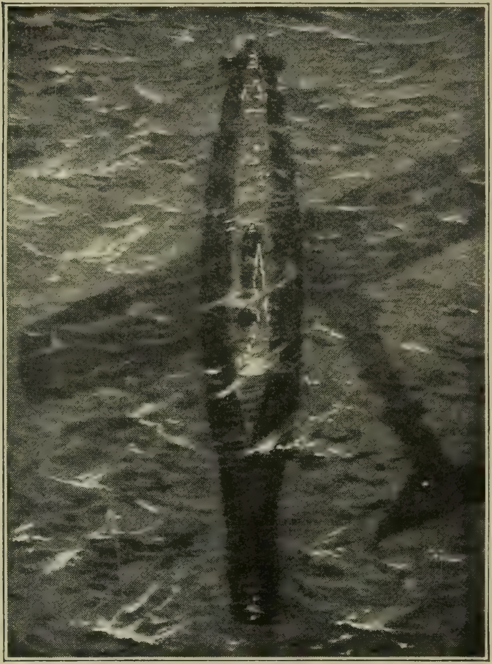
Champion High-Jumper of Africa Making a Jump of 8 Ft. 5 In.

The Olympian record for the running high jump is 6 ft. 3 in., made by Harry F. Porter in 1908. The world's record for the running high jump is 6 ft. 5⅝ in., made by M. F. Sweeney.

ℭAccording to statistics just issued by the Census Bureau, the value of farm property in the United States increased 100.5 per cent during the last census period; the value of the land alone having increased 118.1 per cent.

THE AEROPLANE AND THE SUBMARINE

In the accompanying illustration is shown the shadowy form of a submarine speeding along several feet under water, and, falling across it, the actual shadow of a war aeroplane swooping after it 50 ft., more or less, overhead. It is well known, of course, that objects under water are visible from a height when invisible from the water level.



Courtesy Illustrated London News

The Shadowy Form of a Submarine under the Shadow of a Swooping Aeroplane

In recent British naval maneuvers one of the naval airmen swooped down to within 20 ft. of the top of the periscope of one of the submarines, following it at that height like a seagull after a fish.

ARCHITECTS' EXHIBITION DRAWINGS ON SATIN

The damage to water-color and wash drawings from handling, and in shipment to and from exhibitions, is a constant source of annoyance and loss to architects. One architect has solved the problem by having all exhibition paintings done on satin, as this material can be rolled or folded in any shape without becoming permanently wrinkled. Colors laid on satin also produce a rich and artistic effect, a matter of particular importance in exhibition drawings.

In this work ordinary water colors cannot be used, on account of their tendency to spread along the threads of the fabric. Japanese colors of a special quality are the only ones found suitable. Even with these, the renderer must use extreme care, carrying a light brush and applying the colors delicately.

FIRST CHINESE AIRMAN IN AMERICA

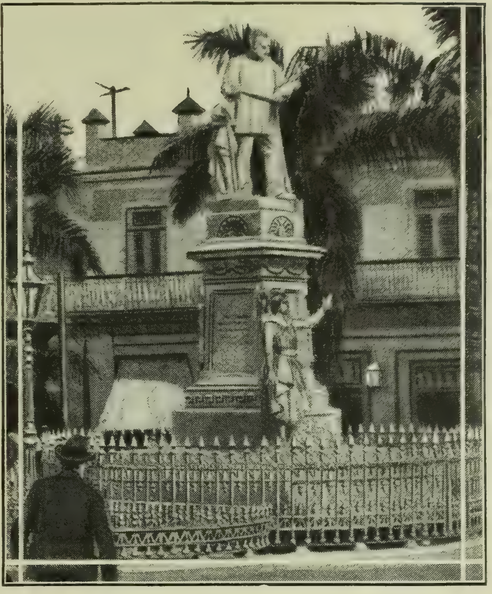
Tom Gunn, Chinaman, who learned to fly in California, and is now using a machine built to his order and equipped with a 60-hp. engine, is shown in the illustration posing with the American and Chinese flags and a prize cup just after a successful flight. He is the first Chinaman in America to receive a pilot's license.

Tom Gunn, Chinaman and Licensed Aerial Pilot

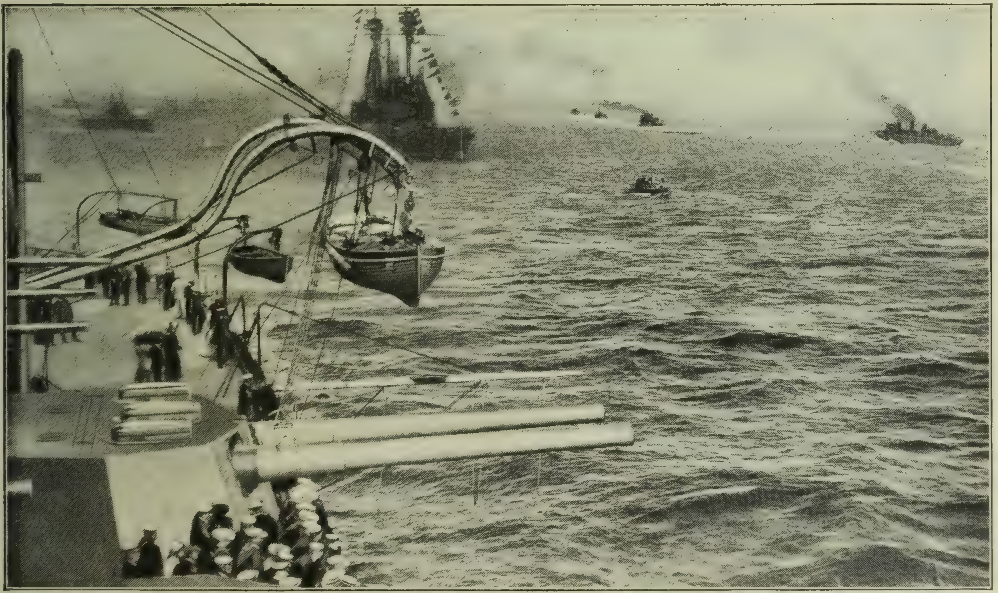
MONUMENT TO A CITY ENGINEER

Nations honor warriors and statesmen by erecting to their memory monuments or statues, but it remains for the city of Havana, Cuba, to gratefully acknowledge the services of a distinguished engineer by placing the handsome marble statue shown in the accompanying illustration in Monserat Plaza.

To Francisco de Albear y Lara the city of Havana owes its waterworks system. The twin masonry reservoirs at Palatino and the splendid aqueduct from this point to the source of supply, making a gravity system carrying the pure water of the Vento springs to Havana, are more expressive and enduring monuments to the memory of General de Albear in the eyes of his brother engineers, but nevertheless it is a matter of gratification to them to know that the citizens of a great city have thus recognized the services of an engineer.



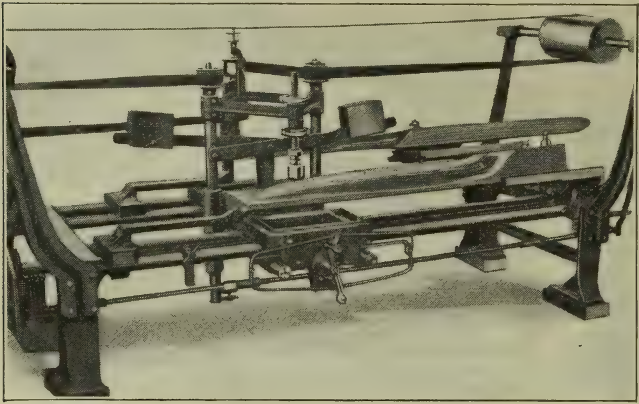
Monument Designed to Perpetuate the Memory of Municipal-Engineer Francisco de Albear y Lara of Havana, Cuba



This illustration of the British battleship "Neptune," the flagship of Admiral Sir George Callaghan, is a reproduction of a photograph taken while the vessel was leading the "dreadnought squadron" out to sea to meet the third and fifth squadrons. The interesting feature of the illustration is the set of overhanging davits to which one of the ship's largest boats is attached.

SPECIAL LATHE FOR AERIAL PROPELLERS

In the Curtiss aeroplane plant at Hammondsport, N. Y., is a lathe especially constructed for cutting out the blades of aerial propellers. The block in the foreground is a pattern which the lathe automatically follows in cutting out the new blades, one of which is shown in position to be worked upon, on the other side of the machine.



A Special Lathe Used at the Curtiss Aeroplane Plant for the Turning Out of Propeller Blades

FISH MEAL USED AS FOOD FOR COWS AND PIGS

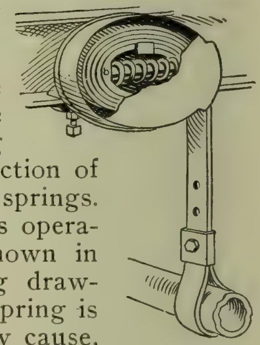
Pigs and cows enjoy fish dinners prepared especially for them, in Norway and Great Britain, and the cheapness of the kind of fish used, together with the good results of such feed in connection with ordinary foods, may be expected soon to put fish on the diet of animals in other countries. In Norway cod and herring are principally used, according to the Revue Scientifique. The codfish are dried, first in the air and then in an oven, and finally the mass is ground. The herring are made into meal by boiling and then putting the mass through a press. Waste from all sorts of fish, and fish which have no value as human food, are used in England and Scotland, the process being to reduce the fish to a coarse flour by steaming, drying and grinding.

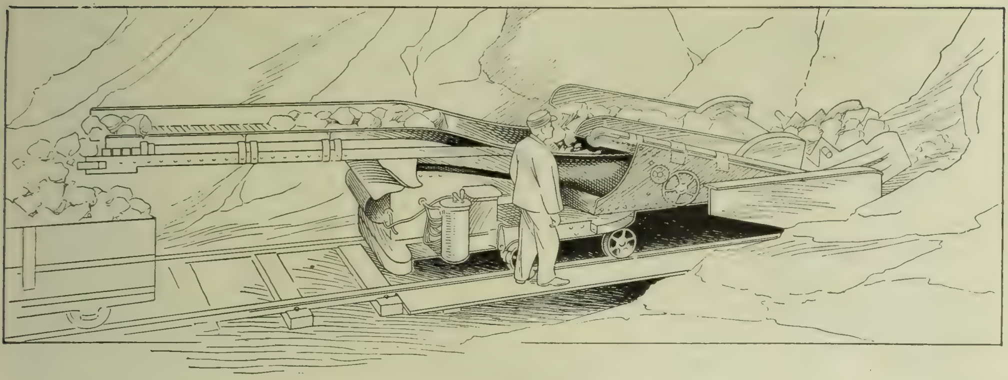
FASTER TRANSPORTATION ON TRANS-SIBERIAN RAILWAY

The time of the express trains on the trans-Siberian Railway has been considerably shortened this summer, and a further reduction in the running time of 24 hours will be made by next year. The time of the express trains from Moscow to Vladivostock is now 8 days 11 hours 35 minutes; from Saint Petersburg to Vladivostok, 9 days 2 hours. The time of the ordinary passenger trains from Moscow to Vladivostok is 12½ days. The Russian Minister of Ways and Communications hopes before many years to provide a six-day train from Vladivostok to St. Petersburg.

REBOUND SNUBBER FOR AUTOMOBILES

Unlike the majority of devices designed for snubbing or checking the rebound of automobile bodies when the wheels strike a rough bit of road, this snubber will act only on the rebound of the weight following an excessive deflection of the spring or springs. The method of its operation is clearly shown in the accompanying drawing. When the spring is deflected from any cause, the belt is tightened up by the coil spring, which is fitted between two shoes, one of which is attached to the casing; and when the main spring recovers as the load is lifted, the strap pulls taut upon these shoes, the coil spring resisting the pressure and slowing down the action of the strap. The more severe the rebound, the greater the resistance of the strap.





A Mechanical Shoveling Device Handling Rock

MACHINE FOR HANDLING ORE AND ROCK

A new mechanical shoveling machine which can be used under a variety of conditions is being placed on the market by a concern in Knoxville, Tenn. Using almost any type of motive power, this machine is adapted for such special lines as loading coal or other material from the floor into pit cars, for the mining of ores and other materials in open trench work, to strip the soil from horizontal mineral deposits, to take the place of stock-house crews in blast-furnace work, to excavate rocks after blasting, and other similar work.

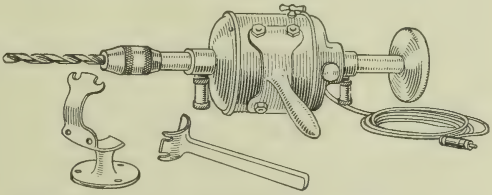
The machine, which may be operated by one man, is self-propelling in either direction at variable speeds. In operation, the shovel at the right end of the machine is forced under the material to be handled, by the forward movement of the entire machine, and when filled tilts back and discharges its load upon the conveyor.

PICKING FLOWERS WITH A SHOTGUN

The assertion that a shotgun is an efficient implement for the picking of flowers could with all justice be considered ridiculous, yet this was the means by which the famous botanists, Mr. and Mrs. P. Amaury Talbot, brought down many of the most valuable specimens gathered by them in Africa. They brought back to England some 2,000 varieties of plants, of which about 10 per cent are expected to prove new discoveries, from an almost unknown part of Southern Nigeria, where scarcely a white man, and certainly no white woman, had penetrated before. Many of these specimens grew on trees, at such heights that the only way to secure them was by shooting them down.

COMBINATION ELECTRIC TOOL FOR GARAGES

A practical and handy combination electric tool for use in the private garage is shown in this drawing. Not only can it be used for drilling, but also for buffing, and for such home repairs as bench grinding for taps, dies and all kinds of edge tools; for lathe grinding, and for internal and external work. Its weight is only 10 lb., the motor develops $\frac{1}{10}$ hp., and the speed is variable between 2,400 and 4,000 revolutions per minute.



A Handy Electrically Driven Combination Tool for the Private Garage

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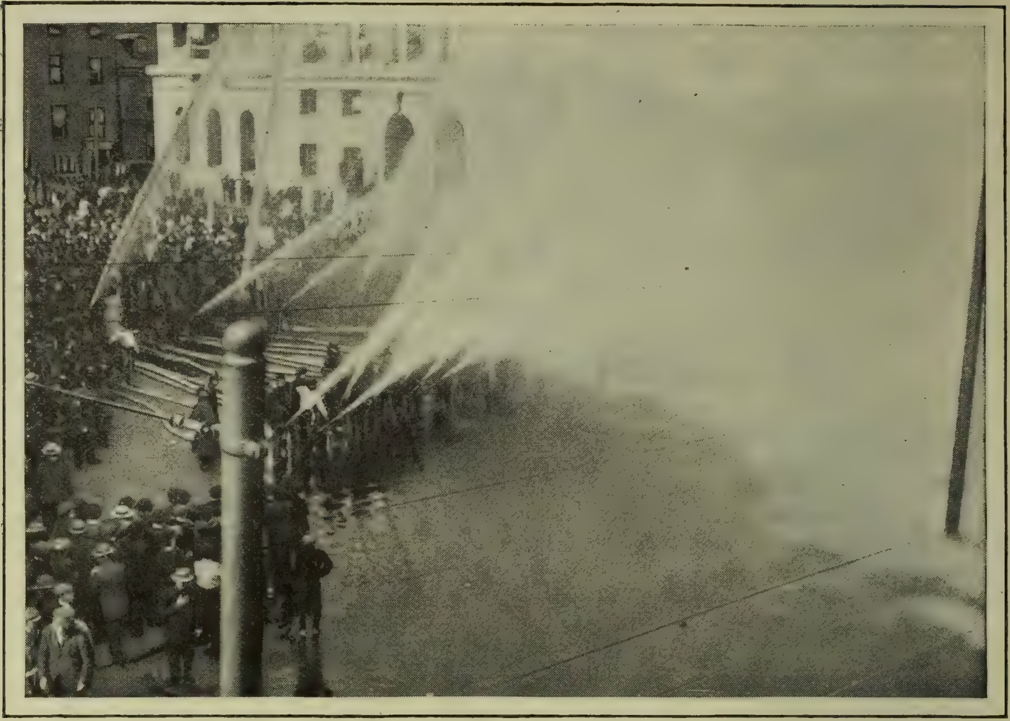
A female draftsman has been admitted to the American Society of Engineer Draftsmen.

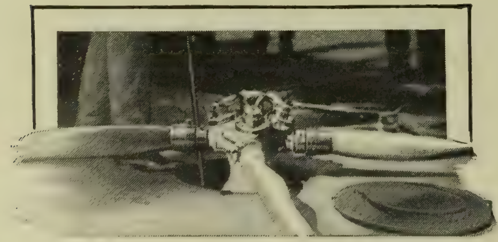


Eighteen Streams from High-Pressure System, Forming a Veritable Wall of Water

HIGH-PRESSURE SYSTEM IS CITIES' PROTECTION

High-pressure pipe-line service is being generally adopted by all large American cities. The latest to install this protection against fire is Baltimore, Md., where a system has just been completed at a cost of $1,000,000.

The system in Baltimore embraces features that are novel, the chief one being the absence of fire plugs. At various places on the line of pipe are manholes, and the plugs, such as shown in the accompanying picture, are carried by the motor hose wagons. These plugs, each of which carries four connections for as many lines of 4-in. hose, are screwed to the feed pipe. A lever turns the water into the plug, and as each of the four connections has its own pressure regulator, it is possible to use four streams, each at a different pressure.



Plug of High-Pressure Pipe-Line System

Some idea of the wall of water that can be formed for the protection of buildings can be gained by the other picture, which shows 18 streams concentrated during a test which was made May 20.

PIER TELEPHONE LINES FOR OCEAN LINERS

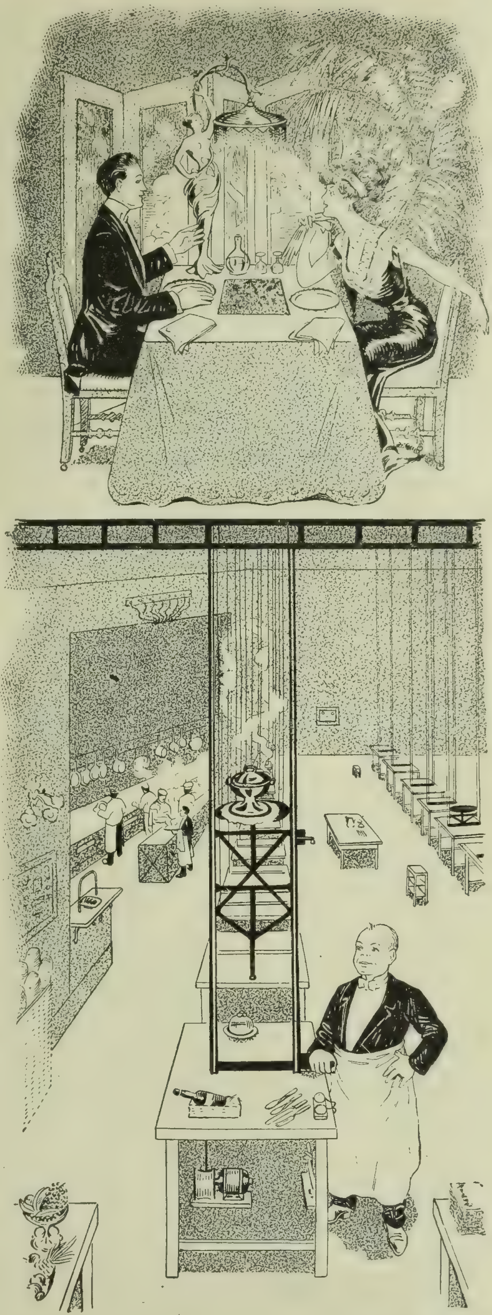
Direct connection between transatlantic liners and the telephone system of New York, while the steamships are at their piers, is now being made possible by the New York Telephone Co. Coin-box telephones are installed on several of the liners, notably those of the Cunard line, and when the vessels reach their piers representatives of the telephone company immediately establish connection with the shore service by plugging a flexible cable from a box on the wharf to another on board the ship. Passengers are thus enabled to telephone to friends before disembarking.

REMARKABLE ELECTRIC-SERVICE HOTEL

A remarkable hotel, every part of which will be operated by electricity, even to the serving of guests in the dining rooms, service in the rooms, and the opening and closing of windows, is to be built in Paris by M. Georges Knap, a well-known electrician whose wonderful electrical house near Paris was described and illustrated in this magazine a year or so ago.

The dining-room arrangement is clearly shown in the accompanying illustration. The kitchen is directly underneath it, and directly under each table in the dining room is a kitchen table from which rises the framework of an elevator which terminates in the top of the former. The bronze lamp standard of each table is fitted with a microphone-telephone, and the person giving the order simply speaks in the direction of this standard, and as soon as the dish ordered is ready it makes its appearance up through the center of the table on a silver tray. Used dishes are returned to the kitchen in the same manner.

Part of the ceiling of the reception or rest rooms and the bedrooms acts as a telephone transmitter. The guest, on awakening in the morning, only has to push a convenient button and speak his or her desires in the direction of the ceiling to obtain instant service. If it is a window to be opened or closed, this is accomplished in a few seconds after the request by electrical machinery, and if it is a cup of tea or coffee, or a complete breakfast or luncheon, this, too, will be forthcoming in short order, the meal making its appearance on the top of a table placed conveniently beside the bed, so that the occupant need not rise.



Arrangement of the Electrically Served Dining Room of an Electrically Operated Hotel to be Built in Paris

Typical Chinese Gunboat, the Principal Duty of Which is to Run Down the Pirates That Infest Inland Waters

CHINESE GUNBOATS

The type of Chinese gunboat pictured in the accompanying illustration is very common on the inland waterways of the coastal plain of China. The boat itself is almost identical with the ordinary cargo craft of similar size; although its lines are generally a little finer, to give it an increase in speed. Otherwise the gun in the bow and the blue and white striped awning are the only distinguishing features. The armament consists of a single smoothbore muzzle loader, the bore in this case being about 2½ in. On a peace footing there are about five men in the crew.

Nominally, these craft are for policing the smaller rivers, creeks, and lakes which are infested with pirates; actually, their principal duty is escorting and saluting higher officials. Some years ago when the viceroy at Hankau returned from a protracted visit to Peking, no less than 50 of these gunboats were lined up along the bank of the Yangtze to salute him. The only limit to the number of guns seems to be the supply of ammunition, for in this case the firing continued for several hours.

Usually, when not saluting, the boats tie up to the bank adjacent to the native village of the captain, where they remain until a case of piracy more flagrant than usual occurs, possibly involving a petty official who has been seized for ransom or robbed and caned. Then peremptory orders are sent out to the commander and captains of the fleet nominally patrolling the district in which the piracy occurred, to capture forthwith the offenders or to suffer disgrace. As a penalty is certain to be inflicted in case of failure, some prisoners are always produced, to be later beheaded. In the rare instances where a pirate is captured red-handed he is put to death by the "ling-chi" or one thousand cuts.

It is not often that the gunboats use their armament in attack; but occasionally they let fly at close range a charge of chilled cast-iron slugs, with results generally disastrous to the enemy.

¶The placement of 97,751 cu. yd. of concrete at the Miraflores locks of the Panama Canal in April is a record, exceeding previous monthly records at any of the locks.

CUTTING DOWN PITTSBURGH'S "HUMP"

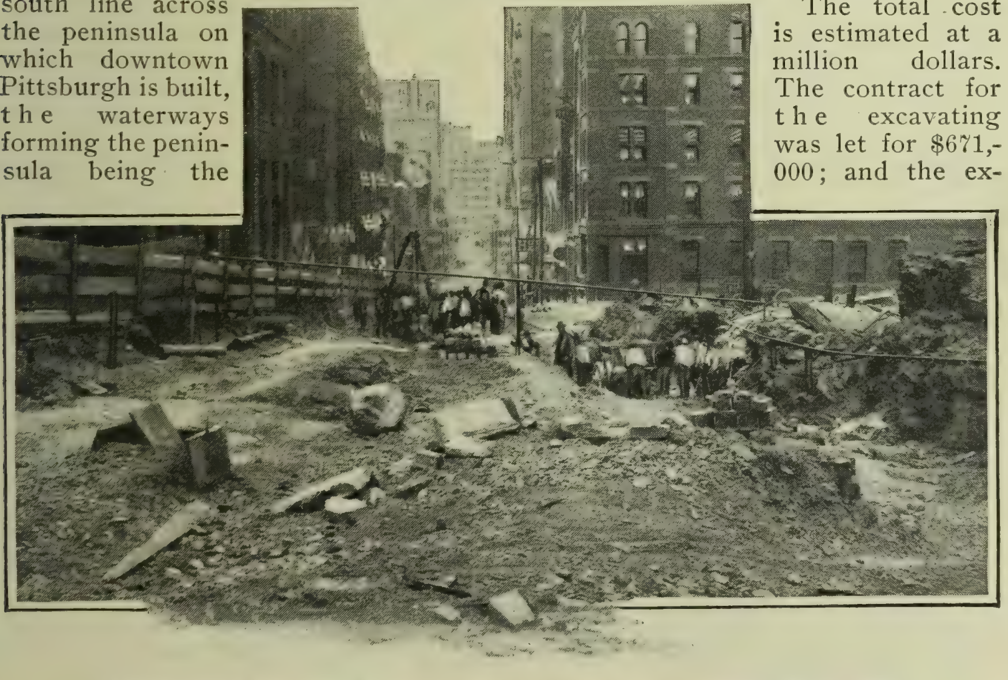
By HARTLEY M. PHELPS

Fifth Avenue, Pittsburgh, with Its Objectionable "Hump"

At Pittsburgh, Pa., they are cutting down a hill that covers 15 blocks in the heart of the city. It is one of the most important improvements ever undertaken by an American municipality—certainly the most important ever started in Pittsburgh; for it means the removal of an impediment to the expansion of the business district eastward. This elevation, locally known as the "Hump" or Grant's Hill, has been the cause of one of the greatest congestions of business and traffic that ever afflicted a large city.

The hill extends in a north and south line across the peninsula on which downtown Pittsburgh is built, the waterways forming the peninsula being the Monongahela and Allegheny Rivers, which unite a mile west of the hill to form the Ohio. Its greatest elevation or summit is 45 ft. or so above the plain below the hill; and the work now going on is the cutting down of the streets from 18 ft. to lesser depths, depending on the slope. Fifth Avenue, the city's main retail artery, passes over the hill at its greatest elevation and here, in front of the famous Allegheny County courthouse the deepest cut is being made. Work was started about the middle of April and is now well under way with steam diggers and gangs of workmen.

The total cost is estimated at a million dollars. The contract for the excavating was let for $671,000; and the ex-



Looking Down from Grant Street, Where It was Necessary to Blast Tons of Rock pense of replacing sewers, water pipes, electric conduits, street-car tracks, etc., will exceed $300,000. The public-service corporations are defraying part of the cost. The damages, if any, will be small, as more than 70 per cent of the owners of abutting property have signed waivers for the same. As a matter of fact, every foot of realty within the "Hump" zone will be benefited. The property owners will have to pay the expense of lowering their lots, but, fortunately, the substantial buildings within the zone were built with the cut in view. Among these are the magnificent Frick office building, 21 stories high; the Carnegie building; the Hotel Henry, and the superb courthouse, Richardson's masterpiece, which cost nearly $3,000,000. The cut will vastly improve the courthouse, which will be above the new grades, whereas it now stands in a sunken court 10 ft. below the summit of the hill.

The present grade of Fifth Avenue on the hill is 7.44 per cent, that is a rise of 7.44 ft. to the hundred; but after the cut it will be an easy grade of half this. Grant Street, which runs north and south in front of the courthouse will be level. According to the engineers' estimates there are 143,000 cu. yd. of earth, including much rock, to be removed. The first shovelful of earth was lifted by Mayor William A. Magee with a silver spade which is now a relic of the improvement.

Owing to the fact that great inconvenience would be entailed to business men and owners of office buildings were the entire district to be torn up at once, only half of the work is to be done this year. Next year it will be completed.

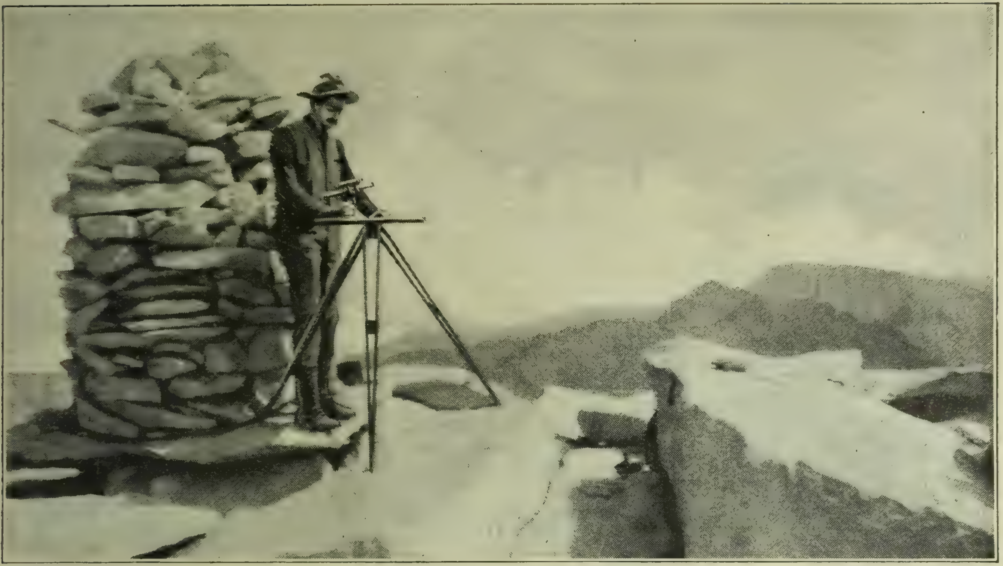
Of equal importance with the paring down of the "Hump" is the comprehensive widening of important streets, which work is being carried on simultaneously. Oliver Avenue, Diamond Street, Strawberry Way and Cherry Way are being broadened and the fine Grant Boulevard is being extended to Grant Street, thus affording a direct route for vehicle traffic to the populous eastern parts of Pittsburgh. These improvements will vastly lessen the intolerable congestion that now makes the lower part of the city resemble the southernmost district of Manhattan, or the old part of Boston.

When the hill is cut down improvements to the value of $30,000,000 or more are to be made. H. C. Frick owns three blocks on Grant Street, on one of which it is said the Pennsylvania Railroad is to build a magnificent downtown depot. The Hostetter estate is to erect a great skyscraper, and stores and office buildings galore will be built. At present most of the buildings on the "Hump" are of ordinary antiquated character. Real-estate values will be doubled and the improvement will undoubtedly pay for itself in a couple of years or so.

HIGHEST AND LOWEST POINTS IN UNITED STATES

The highest point in the United States is Mount Whitney, Cal., 14,501 ft. above sea level. Although at this great elevation perpetual snow might be expected to exist, the summit of the mountain is said to be invariably swept bare by the winds. Several years ago a survey was made from Los Angeles direct to the summit of the peak, and on its summit a special aluminum tablet was placed. The next highest prominent mountain in the United States is Mount Rainier, Wash., also called Mount Tacoma, which is about 14,360 ft. This majestic peak is in large part a vast glacier, and as the apex of the mountain is a huge snowbank of unknown depth, but estimated to be from 60 to 70 ft. and varying from season to season, the altitude of the mountain is not constant. Its highest rock portion is probably at least 200 ft. below that of Mount Whitney.

By a curious freak of nature one can



Mount Whitney, Cal., 14,501 Ft. above Sea Level: the Top of the United States; the Summit of the Peak was Surveyed by George R. Davis, Topographic Engineer of the United States Geological Survey

stand atop of Mount Whitney, the highest point in the United States, and look down, through the clear atmosphere, upon the lowest point in the United States, only 92 miles distant, but 276 ft. below sea level, a difference in altitude of 14,777 ft. This lowest point is three miles from Bennett's Well, which is a running spring of really good water, in Death Valley, Cal. The well is 10 ft. above the lowest point of the most desolate and forbidding region in the country.

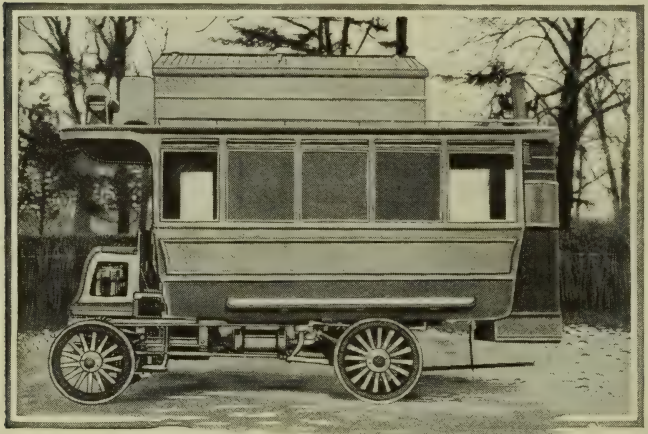
Death Valley was once, many thousands of years ago, a great land-locked lake, and its floor is now incrusted in many places with deposits of salt, borax, soda, potash, and other minerals, the most abundant of which were concentrated and deposited in beds when the ancient lake finally dried up. The famous 20-mule borax team oper-

In the Bottom of Death Valley, the Lowest Point in the Country, Showing the Old Road to Bennett's Well ators hauled borax from these deposits in the old lake bed for many years, and in fact are still mining borax in this desolate region.

It is a rather singular fact that throughout the great Rocky Mountain and Sierra Nevada systems in the United States, while there are a large number of very high peaks, several above 14,000 ft. and very many nearly 14,000, there is no one peak which stands out distinctively above all the others. In Mexico, Popocatepetl and Orizaba both rise above 17,000 ft., and in Alaska, Mount McKinley is 20,300 ft., while Mount Foraker, a sister peak, is 17,500 ft. high. Either of these Alaskan peaks would make the highest mountains in the United States proper, great as they are, appear small.

OLD BUS IS CONVERTED INTO CARAVAN

An Englishman who enjoys long wandering trips along many quiet byways of rural England has provided himself with a somewhat unusual caravan in the form of a motorbus. The chassis is a 12-hp. Milnes-Daimler, of about the year 1902, upon which was placed the converted body of an old horse-drawn omnibus which spent its youth and middle age in traveling London streets.


This Motor Caravan, Consisting of a Chassis of About the Year 1902, Provided with a Body of an Old Horse-Drawn Omnibus, was Put Together by an "Open Road" Enthusiast for Use in Rural England

In a boxlike addition at the rear of the omnibus body is a kitchen range, which, in addition to its use as a cook stove, serves to warm the interior of the caravan. Coal is kept in a box beneath the range, and a long box on the roof serves to store the camp outfit.

EFFICIENCY ENGINEERING FORTY YEARS AGO

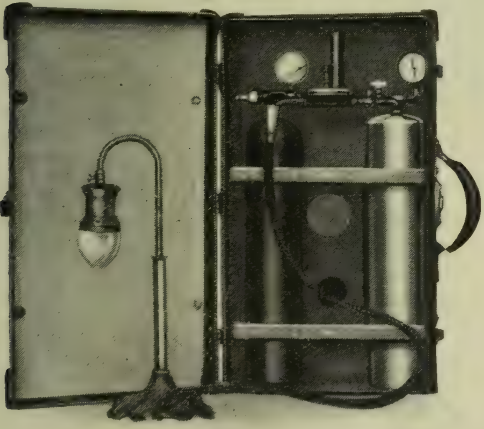
A method of utilizing racial pride as an aid to efficiency, practiced 40 years ago in the building of a large banking house in Philadelphia, is described by a correspondent of Engineering News. The rate of hod-carrying up ladders for three stories was raised to a maximum in this way: The trick was to find a negro with a good sound heart and a first-class pair of lungs, on a stout pair of legs. This darky was paid $5 a day at a time when the other hodcarriers got $2.50.

But the condition on which he worked was that he should break the record and lead the line up the ladder. The rest of the line in that day were Irishmen. Therefore, they hated a darky and on general principles asserted the superiority of the white man. They had to be consistent to their assertions and principles. The result was a stream of brick-laden humanity mounting up those ladders with a celerity not to be beaten by the methods of a modern efficiency expert.

¶The Chinese name for their new Republic is "Chung Hua Min Kuo" which, translated, is Middle Flowery People State.

OIL-WELL GAS LIQUEFIED FOR CONSUMPTION

A new liquid gas now being placed on the market is prepared from "heavy" natural gas, particularly the waste gas which accumulates in the pipes of oil wells. This raw product is a waste material, never utilized until the present. To prepare the new liquid gas, the natural gas is compressed and cooled, and the heavier parts which condense are separated. The lighter parts are next condensed, and are forced under pressure into a vessel called the "rectifier," where they come in contact with coils containing superheated steam, and are completely vaporized. The gases then pass in succession a series of coils, each heated to a somewhat lower temperature than the preceding one, and these coils separate the gases, by a selective action based upon the critical temperature of each gas, into a series of products. The gas, methane, so obtained is used to operate the gas engines which are used in the compression of the gas, and the other gases are liquefied for heating and lighting purposes. This liquid gas is a perfectly transparent liquid, which remains in the liquid form when under a pressure of 500 lb. to the square inch, changing to gas under less pressure. One volume of liquid produces 350 volumes of gas, and the heating power of this gas is claimed to be four times that of coal gas.


Suitcase Portable Apparatus for Using Liquid Gas in Reading Lamp

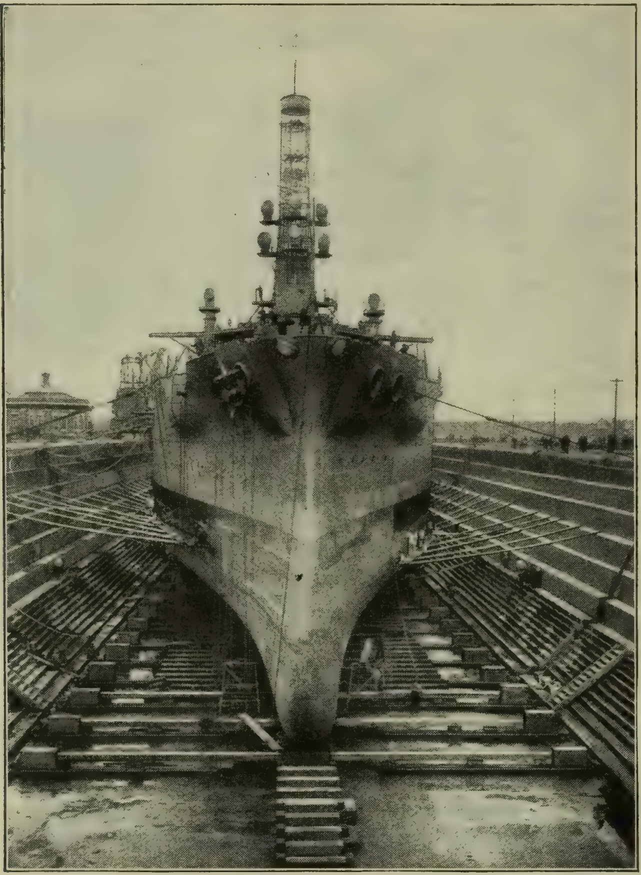
Storage Tank of Liquid Gas Housed on Outside of Building

The ordinary house tank for the storage of the liquid gas is about 52 in. high and 8½ in. in diameter. It may be placed in a housing located just outside the building, as shown in one of the illustrations, and holds the equivalent of 2,000 ft. of ordinary city gas. By means of a reducing valve the liquid from the cylinder changes to gas at a pressure just about the same as that used in the ordinary gas systems for house lighting.

¶A woman in Boston, Mass., received word one day that her brother was dead and a week later was startled to see his face and figure shown prominently on a moving-picture screen during the course of a show that depicted scenes hundreds of miles from any point she had ever known her brother to visit.

THE U. S. S. "ARKANSAS" IN DRYDOCK

The enormous bulk of the superdreadnought "Arkansas," one of the latest additions to the U. S. Navy, is here shown at the League Island Navy Yard, where she was towed to be painted and finished. The big vessel was docked with difficulty, and little room remained at the sides of the dock when she was finally warped in.



The U. S. S. "Arkansas" Tested the Capacity of the Drydock at the League Island Navy Yard

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ℭIn London one of the important attachés of a prominent theater is a young woman, "the whisper girl," whose business it is to receive telephone calls for the patrons of the show, thus saving them the annoyance of leaving their seats unless it is absolutely necessary.

PLOWED FIELD AS HIGH-VOLTAGE CONDUCTOR

One of the large hemp-center stranded copper wires of the Central Colorado Power Co.'s 100,000-volt transmission line broke recently, allowing the two ends to fall to the ground in a plowed field. The time the break occurred was one o'clock in the morning, and the system was carrying 3,700 kw., but the ground connection thus established continued to carry the load without incident for several hours, according to the Electrical World Magazine. During this period one of the wires finally burned back to the point where it hung suspended from the tower, thereby setting up a series of arcs between wire and ground and causing surges which attracted the attendant's notice by the swinging of the station-instrument needles. When the trouble was located the stranded conductor between the towers was found in the shape of a number of short sections averaging 6 in. in length, and below the end of each was a cone-shaped formation in the clay soil, where the earthy matter had been fused to a mass of slag. As each section of conductor burnt off, the live end left had apparently established a new point of contact, about 6 in. from the end, where it was in turn severed. Some of the slag masses or fulgurites measured 6 in. in diameter at the top, tapering to 2 in. at the tip, 18 in. below the ground, and the surface of each was covered with numerous little spines or roots, apparently marking the points where the current entered the surrounding earth. In other places the fused mass lay in the direction of the line, and for several feet around this the ground was too hot to stand upon, even three hours after the current had been shut off.

Since the accident the field has been replowed, bringing to light numerous sections of the once molten, glassy path which joined the conductors.

BRIGHT GOOSE TRAINED TO DO TRICKS

A trainer of birds and animals in London has trained a goose to a degree of cleverness said to be truly remarkable. The owner explains that although he has been teaching tricks to birds and beasts for the past 30 years, this is the first intelligent goose he has found. It accomplished all the usual tricks taught to animals for exhibition purposes, such as picking out cards, counting, ringing the lunch bell, taking the contents out of baskets, etc.

The Trained Goose Partaking of Lunch from a Table and Ringing the Bell for Luncheon

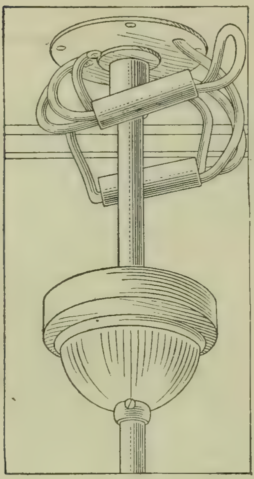
MOTOR BUS VS. TRAMCAR IN LONDON

Motor omnibuses will not entirely supplant the electric tramcar in London for some time, if a recent report of the Highways Committee of the metropolis, which considers both forms of transportation, receives due consideration from the British Board of Trade.

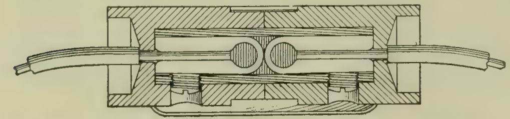
Last January the Roads Improvement Association complained to the Board of Trade, alleging that the municipal tramway cars obstructed the streets. After careful investigation as to the relative number of passengers carried by busses and tramcars, the committee found that more passengers used the cars than rode in the busses; and, in fact, that the cars were capable of handling more than the busses. The report states that, as there was ample accommodation for the passengers in the cars, and these were in operation before the busses on the same routes, it is the latter that obstruct the streets.

The enormous vehicle traffic of London's streets is indicated in the report. To obtain necessary information, observations of bus traffic were made between 9 a. m. and 5 p. m. at busy centers. At Charing Cross, Piccadilly and Oxford Street 5,480 busses were noted, an average of 685 an hour. The average number of passengers in each, however, was only 10.97. The report suggests that the association's charge that the tramways run too many cars applies equally to the bus companies. In practice, it is said, the council operates, between 10 a. m. and 4 p. m., only 69 per cent of the number of cars running morning and evening. If electric cars were entirely withdrawn, says the report, and the same seating capacity had to be provided by busses as is now furnished by the cars, 2,688 busses, or an increase of 114 per cent, would be required during fine weather, while during inclement weather, when only inside seats could be used, 5,712 busses, or an increase of 354 per cent, would be required.

NEW ELECTRIC-WIRE CONNECTOR



An electric-wire connector, which eliminates the necessity of soldering and winding tape on joints in electrical installation and fixture wiring, is shown in the accompanying illustrations. The interior construction of the device, which is 2 in. long and ⅝ in. in diameter, is clearly shown in one of the drawings, indicating how each wire is wedged into place. The loosening of two screws is all that is necessary for the removal of a fixture connected up by it.



Interior Construction of New Electric-Wire Connector

COOLING POWDER MAGAZINES ON FRENCH WARSHIPS

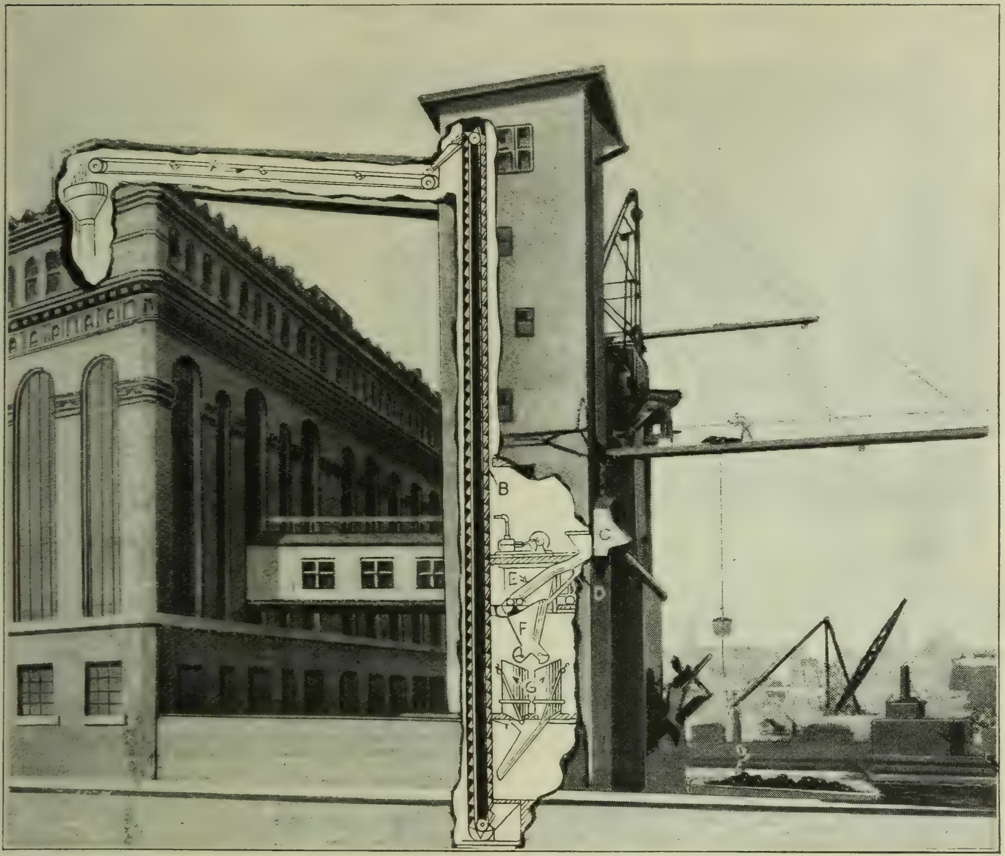
Earnest attention has been given by the French naval experts to maintaining a pleasant, moderate temperature in the powder rooms of the two latest French battleships, owing to the awful lesson of the explosion of the battleship "Liberté" which was believed to be at least in part due to too high temperature in the magazines. A simple, lightweight, easily maintained refrigerating apparatus has been adopted, which the designers believe to be far in advance of other systems for this purpose. It is a development of the Leblanc system, the cooling resulting from the rapid evaporation of a fine spray of water when a current of air is passed through it. The more rapidly the vapor is drawn off, the more cold results, and in these model systems four electric rotary pumps draw off the vapor at an exceedingly high rate. The machines weigh only half as much as carbonic-acid machines of equal efficiency; they do not need a constant supply of chemicals, which might be difficult to obtain under war conditions, and they operate with practically no noise.

NATURE OF GLARE FROM WHITE PAPER

An analysis of glare from paper is made by a writer in the Electrical Review and Western Electrician. It is well known, he says, that glare in any of its forms diminishes the effectiveness of an illumination. We are able to see printed letters because of the contrast between the dark letters and the bright background. The reflection from commercial papers is a combination of diffuse, or widely spread out, reflection and specular, or mirror-like, reflection. The greater the amount of diffusely reflected light compared with the specularly reflected, the less is the annoyance from glare.

Those who have difficulty in forming an idea of these two kinds of reflection can construct a model of a semidiffusing paper by placing a clear, plane sheet of glass over a white, mat surface, such as a blotting paper. The glass will reflect specularly, while the blotting paper reflects diffusely.

ℭA new product of seaweed, "norgine," used for softening textile goods, is being manufactured in Norway. It is made from kelp, which consists of the ashes of the seaweed Laminaria.



Courtesy Engineering News

Combined Coal Unloader, Crusher, Weigher and Elevator. A, Belt Conveyor; B, Bucket Elevator; C, Hopper; D, By-Pass Chute; E, Feeder; F, Flap Gate; G, Weighing Hoppers

COMBINATION COAL DOCK, ELEVATOR AND CRUSHER

The coal dock of the New York Railways Co., New York City, has an interesting system of taking fuel from barges, and crushing, weighing and delivering it to conveyors in the monitor of the power house, 138 ft. above the ground. The boom of the hoist is at a height of 60 ft. and between this elevation and the ground is a collecting hopper, a crusher, and the storage and scale hoppers. The coal, after discharge from the grab buckets, which take it from the barges, passes through a descent of about 40 ft. in which it is crushed and weighed. Then the endless chain of buckets elevates it 120 ft. to an inclined belt conveyor, which delivers to the conveyors in the power house.

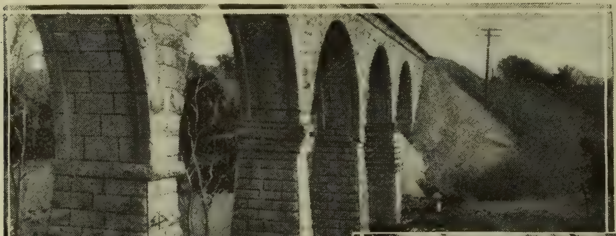
ALCOHOL FOR HEATING NEW FREIGHT CAR

Denatured alcohol is the fuel used to heat a specially constructed freight car, manufactured by a Chicago company. The heating apparatus consists of a fuel-supply tank underneath the car equipped with special burners, the heat from which is carried by longitudinal ducts under the floor of the car and at its end ascends to the roof. In this manner the heat is circulated uniformly throughout the car.

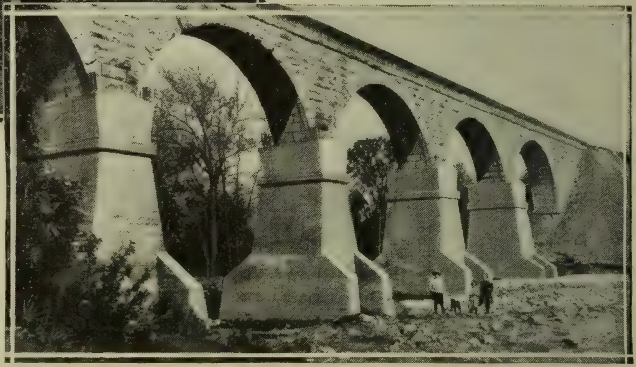
ℭA new electric lamp with a filament so closely wound that it resembles a mantle for an incandescant gas lamp has been successfully tested in the French lighthouse service.

STONE BRIDGE REINFORCED WITH CONCRETE

A stone arch bridge on the Chicago & Alton Railroad between Alton and Jerseyville, Ill., having been constructed for much lighter traffic than at present, began to break at the narrowest portion of the piers. The upper portions of the arches, however, were in good condition, and repairs were made by placing steel bands around the piers and reinforcing with concrete in the manner shown. The bases of the concrete reinforcing are 8 ft. below the surface.

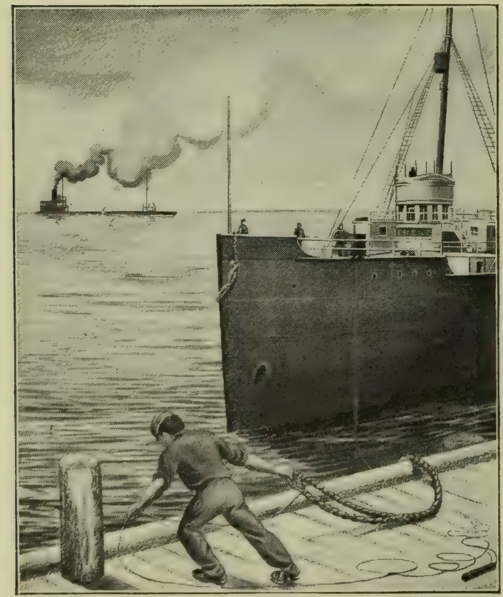


Stone Arch Bridge on Chicago & Alton Railroad before Repairs



After the Steel Bands Had Been Placed and Concrete Built Up around Each Pier

ℭThe new annex of one of the big hotels in Boston has been furnished with fireproof steel furniture.

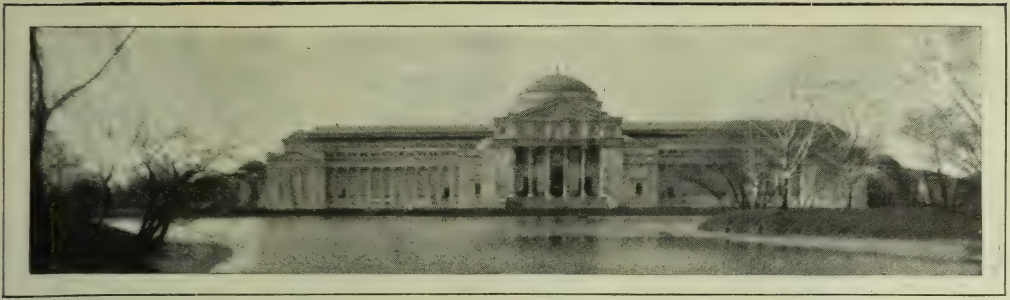


Hand Loop on Eye of Mooring Cable, Designed to Protect the Sailors from Injury

HAND LOOP FOR MOORING-CABLE EYES

The Pittsburgh Steamship Co., which operates 106 big freight boats on the Great Lakes, has equipped all the wire-cable mooring lines used on these vessels with a hand loop, the purpose of which is to prevent the sailors from losing fingers while dropping the lines over dock piles. A small loop of ½-in. cable is attached to the end of the mooring eye in the manner shown. Previous to this arrangement the men had to take hold of the sides of the eye and often got their fingers caught between the pile and the cable.

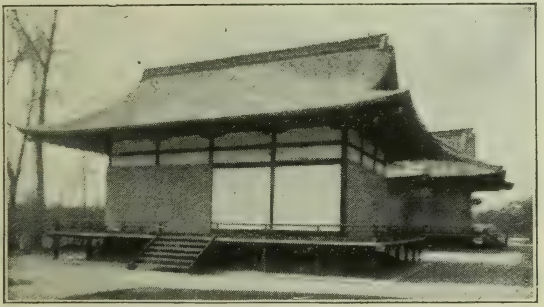
ℭLess than 3 per cent of the land in Norway is under cultivation; 25 per cent is covered with forests and the remainder consists of moors, mountains, lakes and marshes.



A Reproduction from a Photograph Taken with a Camera in Which a Very Small Hole was Used to Admit the Light for Exposing the Plate

MAKING PICTURES WITHOUT CAMERA LENS

Over 300 years ago, Porta, an Italian naturalist invented the camera obscura in which a pinhole played the important part in producing nature pictures on a screen. Not until Daguerre perfected the process of fixing the pictures to make them permanent did the camera come into prominence.



A Picture Which was Made with an Ordinary Box of About 4-In. Focal Length, Using a Pinhole Substitute for a Lens

While the pinhole was the forerunner of the lens, its use in making photographs was overlooked until artists and photographers realized that there are no pure blacks or whites in nature, that the eye does not see the nearby object and the distant village at the same time with equal sharpness, and they agree that a sharp definition is not necessary, in fact would be inartistic. Considering these facts, instead of using the modern anastigmat lens, the pinhole produces the picture desired with a diffusion of focus and an equal softness. The only purpose of a lens, then, is to obtain speed. The pictorial lens now so popular is one with which it is impossible to obtain a sharp focus and for this reason the pinhole process can be made to answer the purpose of the modern lens in many instances.

The illustrations, showing the Field Columbian Museum and the Japanese buildings in Jackson Park, Chicago, were made with an exposure of one minute, the focal length being about 4 in., in a box with a pinhole substitute for a lens, which is illustrated in Fig. 1. The box was made with inside dimensions ¼ in. larger than a 5 by 7-in. dry plate, and a focal length of 4 in. The back of the box swings on hinges and a hook hasp holds it against the box end. The box is not hard to make and the

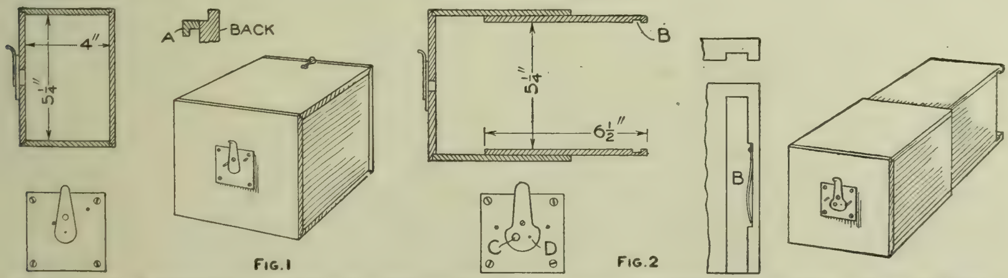
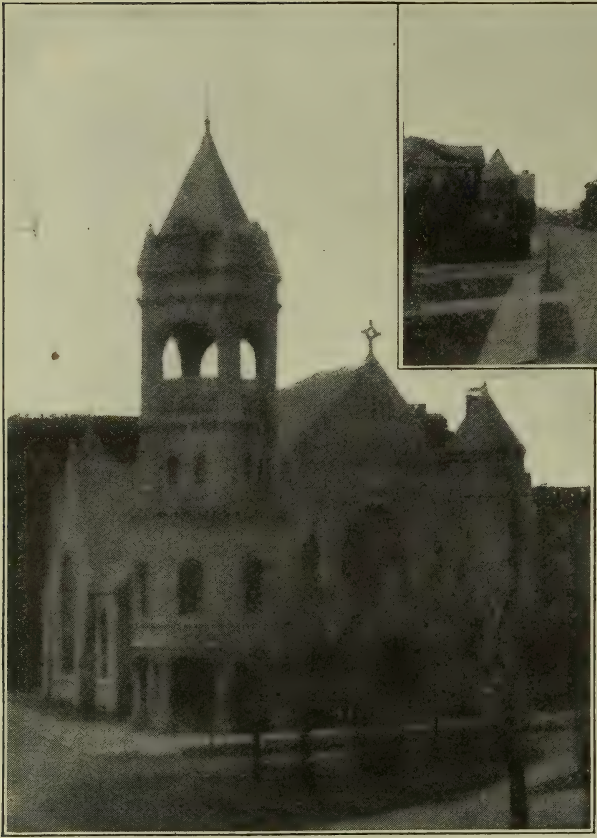


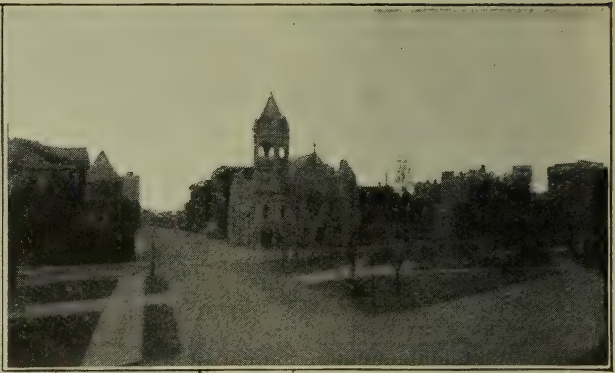
FIG. 1

FIG. 2

Two Forms of Homemade Boxes, One with a Fixed Distance and the Other Telescoping, Used to Make the Photographs Reproduced in This Article



The Focal Distance in Producing This Picture was 13 In. The Two Pictures, Taken from the Same Distance, Show the Relative Sizes Obtained with Different Focal Lengths



The Plate for This Picture was Exposed through a Pinhole at a Focal Distance of 4 In.

only essential part is to have it perfectly light-tight and coated on the inside with a dull black paint. In this instance the plate was put in the box in the dark room and fastened with thumb tacks at each corner. A better way would be to fasten small pieces of wood with hot glue to the inside hinged back cover as shown at A, Fig. 1, to make grooves for the plate.

The pinhole was made in a 2-in. square piece of brass on which a shutter was mounted to swing easily on a screw. The pinhole, which is the essential part, can be made by locating the exact center of the brass and driving a very sharp-pointed instrument into the metal, not to puncture it, but to make the metal bulge a little on the opposite side. This bulge is cut through by using a very fine stone or emery cloth on a stick. The rubbing should only continue until a very tiny hole is produced. The metal then should be blackened so that no reflections can be produced from the bright parts.

The bulged side of the brass is placed on the end of the box over a hole that is bored in the wood to receive it. After the plate is fastened to the box with screws, the shutter is cut from another piece of brass and attached over the pinhole, as shown, so that it will swing easily yet not too freely. As stated before, the plate is placed in the box in the dark room, the shutter closed and the camera taken to the object to be photographed. The process of setting the camera and making the exposure is similar to using an ordinary box camera.

To go into this work deeper, a camera shown in Fig. 2 can be constructed which will give the operator a chance to do considerable experimenting. The illustration of the church was made with a pinhole for a lens, the camera being at the same distance from the edifice in both exposures. This illustrates that the reversed picture thrown on the screen can be changed in size by a difference in the focal length. The smaller picture was taken with a focal length of 4 in. while the larger one was made with this distance being

13 in. The definition is not so good in the long focal length as in distances of from 4 to 6 in. The exposure for the 4-in. focus being 1 minute and for the 13-in. focus twice as long.

The construction of this camera can be more elaborate. Grooves may be cut as shown at B to hold a plate holder. A spring clip is attached in the upper and lower part of the box to hold the plate holder tightly against the front part of the groove. The use of a plate holder makes it desirable to use a ground glass. Such a glass can be easily mounted in a frame which has the same outside dimensions as the plate holder and is inserted in the same manner. The use of a plate holder gives the operator the same privileges as if using an ordinary hand camera. The camera is made of two boxes, one to fit in the other so that they will telescope and produce a varying focal length. The construction of the front box is very similar to the first with the exception of the back, which is left off to receive the smaller box and then the back is placed on the latter in a similar manner, or grooves made as described to hold the plate holder.

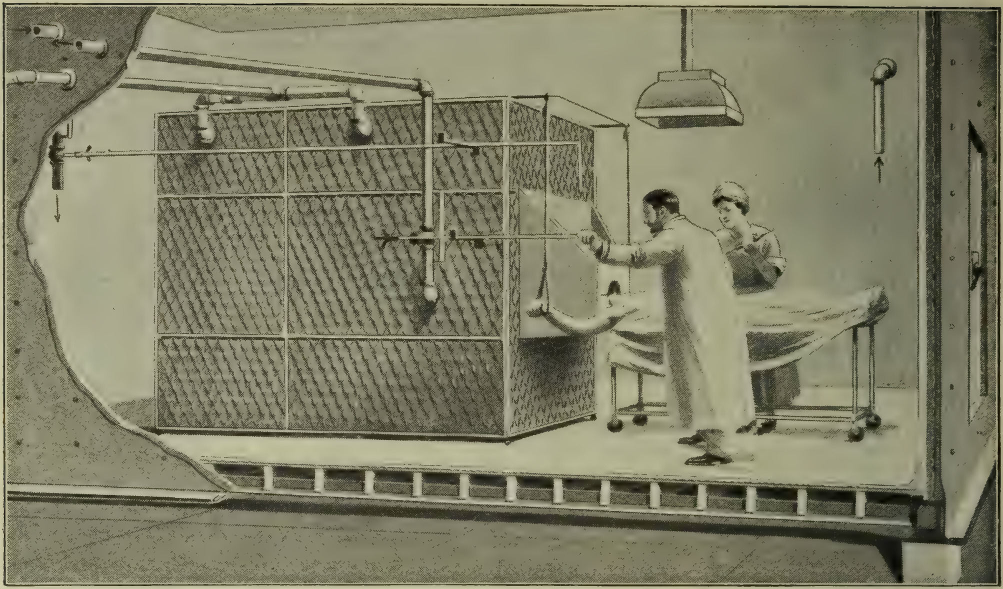
The pinhole for the latter described camera is made in the shutter part and a much larger hole is drilled in the center of the plate. The shutter in this instance has two holes, the one at C is $\frac{1}{16}$ in. in diameter and is used in setting the camera and finding the focal length for the size desired. The other one, D, being the pinhole. After the camera is set, the shutter is left central, which covers the large hole in the plate. The lower part of the shutter is moved to the left, which brings the pinhole over the hole in the plate to make the exposure. On either shutter pins are located for stops to keep it from passing too far over the hole in the plate, and care must be taken to have the shutter carying the pinhole so adjusted that it will not move from any slight jar after it is set for making the exposure.

The pinhole may not be a satisfactory substitute for the modern highly developed photographic objective, yet very interesting and unusual pictures can be obtained with it.

APPARATUS FOR PERFORMING OPERATIONS ON THE CHEST

The development of surgical skill under the modern aseptic or clean method has enabled the surgeon to invade many cavities and attack many organs of the body which were hitherto forbidden ground. The chest cavity may now be opened for the removal of collections of pus, to remove foreign bodies, to open abscesses in the lungs, to close up wounds or to remove gangrenous or even tuberculous portions of the lungs. It is found, however, that if the chest wall of a living being is opened by an incision sufficient to permit the entrance of the outside air, which has a pressure of about 15 lb. to the square inch, the lungs collapse and the being dies. This can be overcome by making the pressure to which the open thorax is exposed less than that of the air breathed, and extensive operations on the lung may then be made by placing the head of the patient in a chamber in which a pressure above that of the surrounding atmosphere is maintained, or by placing the body in an atmosphere of lessened pressure. Both methods have been employed by means of airtight cabinets in which either the head or the body of the patient is placed. Some of these have been so constructed that the surgeon was required to remain on the outside of the cabinet and operate with his hands thrust through protected openings in the sides of the cabinet, watching his work through a glass window.

W. and J. Meyer, surgeons of New York, have devised and patented a cabinet employing either positive or negative pressure, or both at the same time,



Modern Air Cabinet and Operating Air Chamber, both Contained in an Ordinary Hospital Operating Room, to Enable Surgeons to Vary Air Pressures on Different Parts of the Body of a Patient Undergoing an Operation on the Lungs

of sufficient size to permit the anesthetist, the surgeon and his assistants to be inside during the whole operation. It consists of two chambers, one for the body of the patient, which rests on an ordinary operating table, the surgeon and his assistants, and another smaller chamber into which the head of the patient projects, with a shutter closing around the neck of the patient and preventing the interchange of air between the two chambers. The anesthetist also sits in this chamber, to which air is conveyed through a pipe by means of an electric pump, any desired pressure being maintained by means of a valve to which is attached a gauge. This is a positive-pressure chamber, and is perfectly ventilated at all times.

The operating chamber has connected with it a system of pipes and valves and a suction pump, which reduces the air pressure below that of the atmosphere, to any desired degree, as shown by a gauge. This chamber is also perfectly ventilated at all times. The operation can be done under negative pressure in the operating chamber, or under positive pressure in the anesthetizing chamber; or both may be used at once, and the collapse of the lungs prevented perfectly until the chest wall is closed. The cabinet is made of a framework of angle-iron, wire screen and copper sheeting, with a wood and cement floor, and has an air lock connected with the anesthetizing chamber lined with rubber or other airtight material. A window between the operating chamber and the anesthetizing chamber enables the surgeon to watch the face of the patient during the operation.

SEAWEED AND CABBAGE TURNED TO RUBBER

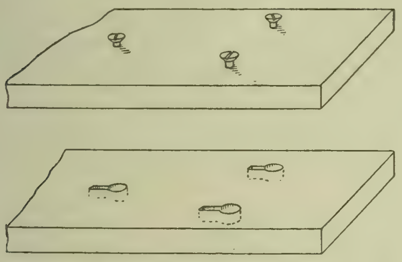
A substitute for rubber, the base of which is seaweed or other marine plants, has been patented by an English inventor. The process involves boiling the seaweed in ammonia, after which is added oil with a glutinous or resilient binding material, the whole being agitated while in a heated condition. The substance has the characteristics of rubber and is capable of partial or complete vulcanization. In addition to or in place of the seaweed other vegetable matter may be added, such as tree or cabbage leaves.

Shop Notes

Joining Boards without Glue

Some climates will not permit the use of glue in fastening wood surfaces together. Sometimes, also, glue is not available. In either case, the two surfaces may be readily and securely joined with screws as shown in the sketch. The screws are turned into one surface, allowing a certain portion of them to project. The heads of all the screws should be an equal distance above the surface.

Turn the piece over and place the heads on the other surface and strike lightly with a hammer to mark the location of each screw. Bore a hole on each mark to receive the screw head. Cut a slot from each hole, the size of the screw shank, and all in the same direction.



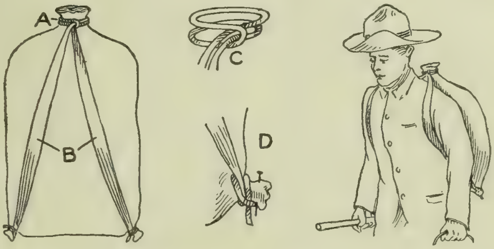
The Projecting Screw Heads When Driven into the Slots Draw the Surfaces Together

Place the surfaces together with the heads of the screws in the holes and strike one or the other piece in the right direction endways to drive the screws into the slots. This will draw the surfaces very closely together.—Contributed by William R. Newhold, Empire, Canal Zone.

ℭA cutting-off tool should not be set by guess—use a square.

An Emergency Pack Strap

The pack strap can be made of an old sack, strong cloth or a piece of rope. If a rope is used, it should be fitted with a pad to protect the shoulders. A loop is made in the center of the strap, as at A, the ends B being long enough to tie at the bottom corners of the pack. The loop at A is more clearly shown at C, and the bottom corners are tied as shown at D after placing a rock inside each. The pack is easily carried on the back as shown.—Contributed by W. A. Lane, El Paso, Texas.



Pack Strap as It is Attached to a Pack and Slung on the Shoulders for Carrying

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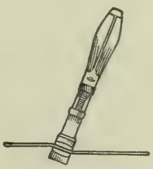
To Take Up Slack in Wire Fences

When the wires of a fence become loose, they may be successfully tightened without taking them from the posts, in the following manner:

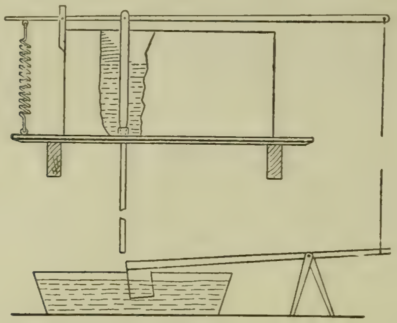
Use an ordinary monkey wrench and close the jaws to easily slip over the wire. Slip them on the wire and pull down as when turning a nut until a bend is made in the wire as shown. Make as many such bends as is neces-



sary to tighten the wire sufficiently. Do not make the kink too short. This is a very handy way to stretch wires around flower beds or small places where a stretcher cannot be used.

Watering Tank for Fowls

From a tank placed on a bracket shelf near the ceiling of my chicken house I ran a ½-in. pipe down and into the water dish. I then made a float of a tin can and attached it to the end of a lever with the float resting in the dish in such a position that an increase of the amount of water would cause the float to rise and produce a downward motion of the opposite end of the lever. To this end I attached a cord which extended to a lever above the water tank, operating a cock valve at the top of the feed pipe as shown in the illustration.


Automatic Opening and Closing Valve on a Supply Water Tank for Fowls

A coil spring holds the valve open when the water in the watering dish is low and allows the water to flow in until the float rises, which closes the valve and shuts off the flow until the water is again lowered in the dish.—Contributed by Patterson D. Merrill, Chicago.

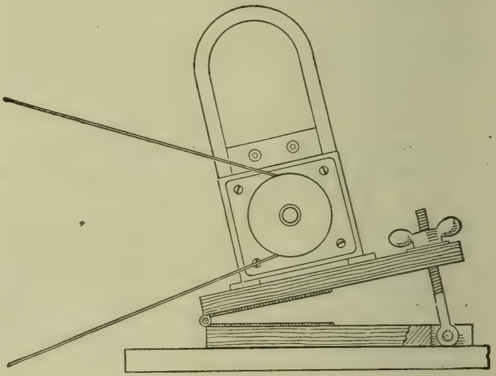
Removing Snags from a Sand Beach

One of the difficulties which the caretakers of a bathing beach encounter is the removal of snags, such as large tree branches or trunks, and timbers which become deeply imbedded in the sand during storms.

To lift out a snag, a block and tackle is hitched to it and to the top of a small tripod constructed of timbers. With the aid of one or two men, small branches and timbers that are not too deeply imbedded can thus be easily removed. For larger branches and whole trees it is necessary first to loosen the sand around the buried parts. This loosening is accomplished by means of a stream of water pumped from the ocean or lake by a portable pump driven by a gasoline engine. A hose leads from the pump to a 10-ft. piece of 1-in. or 1½-in. pipe, which the operator pushes into the sand. As the water issues from the end of the pipe, it loosens the sand so that the pipe can be pushed down to its full depth, if necessary. After the water jet has been applied in a sufficient number of places, the snag is hauled up by means of the block and tackle.—Contributed by J. J. O'Brien, Buffalo, N. Y.

An Adjustable Base for a Magneto

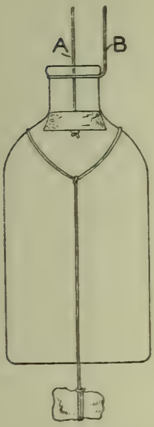
The illustration shows a simple method of mounting a magneto, bilge, air pump or any other small machine that is belt or friction-driven. The arrangement of the device makes it possible to take up any slippage of pulleys, etc., without cutting and splicing the belt, or stopping to reset the magneto.


The Base Consists of Two Pieces Which are Hinged, and Adjusted with a Bolt Having a Thumb Nut

One of these devices was attached to an air pump for supplying pressure to automobile tires, and a number were put into boats for magnetos, all of them giving entire satisfaction.—Contributed by H. R. Read, Brooklyn, N. Y.

Securing Pure Water from an Open Well

Where it is necessary to draw drinking water from an open well or spring, pure water can be taken from beneath the surface in the following manner:

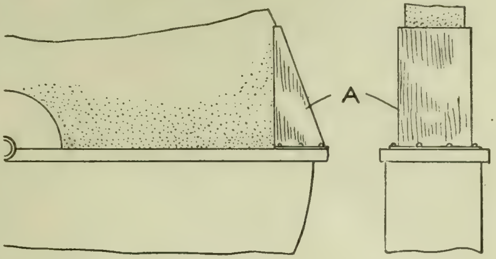


Insert a cork in a bottle in an inverted position, as shown in the sketch, having first attached a stout cord, A, to it. A weight is then swung to the neck on the outside as shown. Attach another stout cord, B, to the neck and lower the bottle into the water by holding the cord A. After the bottle has entered the water far enough, change the hold from cord A to B. The water pressure will push the cork into the bottle and this will be filled with water. The bottle is then raised with the cord A.

This method not only secures pure water, but water that is quite a little cooler than if obtained at the surface.—Contributed by George Anderson, St. Paul, Minn.

Water Guard for a Grindstone

A grindstone that rotates with a small part of its lower circumference immersed in a reservoir or basin for the purpose of moistening the stone, has a tendency to pick up the water and throw it in the direction in which the stone is turning. The larger the stone, the greater the amount of water thrown out, and the result is an unsightly and unsanitary floor, besides being an annoyance and inconvenience to the man who attempts to grind tools on that side of the stone.



Guard Attached to the Grindstone Frame to Deflect the Water Back into the Pan

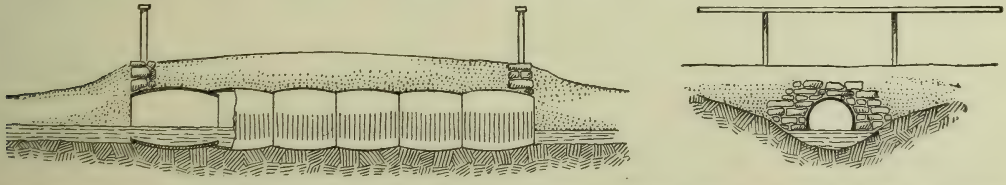
The accompanying sketch shows a pyramid-shaped guard, A, that can be secured to the framework of the shaft. The upshooting water encounters it and is deflected back and down into the basin below. The guard's shape is such that it is not in the way of anyone working on that side of the stone. It is constructed of galvanized iron or heavy tin.

Inexpensive Temporary Culvert

A temporary culvert can be made of old oil barrels or beer kegs at a very low cost. Contractors and farmers are often in need of such a culvert that is only required for a short time.

The top end of each barrel is cut off so that the bottom end of one barrel will slip into the top of the other about 4 in. The bottoms are knocked out after cutting the top ends off. The barrel laid in last requires no cutting.

The bottom of the trench should be



The Barrels are Slightly Telescoped and Nailed to Hold Them in Place until the Filling is Put on Them. The Ends of the Culvert are Built Over with Rocks to Hold the Filling made rounding to allow the barrels to fit in tightly, whereupon these are put into place, one by one, and nailed. Earth should be carefully filled in on the under side where the barrels are joined together so that pressure from above may not cause leaks, and the filling on top should be well tamped. If a 2-ft. filling is provided above a culvert made of ordinary beer kegs, heavy traffic can pass over it without causing any damage.—Contributed by Geo. Kanzler, Elizabeth, N. J.

Lengths to Cut Material for Making Bands

Some blacksmiths cut bands by three times the diameter, which is not correct, as the circumference is about 3.1416 times the diameter. The fractional part is impossible to determine definitely, but the following method makes the cutting of the bands sufficiently accurate for all practical purposes, and is easily accomplished.

Use a board 10 in. wide and 30 in. long, which is made smooth to receive the lines. Erect a right-angle triangle from one edge of the board which is used for the base, the hypotenuse being 22 in. long and the perpendicular 7 in. high, as shown in Fig. 1. A circle with a diameter of 7 in. has a circumference of approximately 22 in., as 3.1416 × 7 = 21.9912 or almost 22 in.

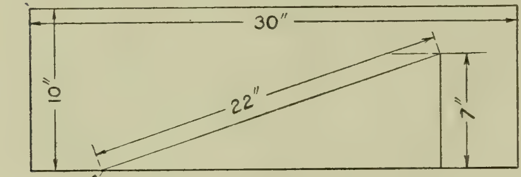


FIG. 1

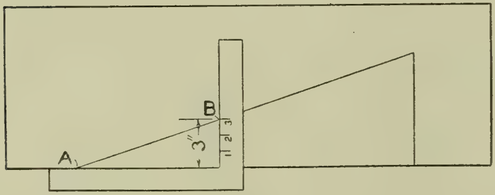


FIG. 2

The Board with the Right-Angle Triangle and the Measurement for a 3-Inch Band

The length of iron to make a band of any given size can be found by laying the steel square on the board with the short leg across the hypotenuse line, as shown in Fig. 2, when the length from A to B will be the circumference. For example, suppose a band with a diameter of 3 in. is required. Set the 3-in. mark on the square on the hypotenuse as at B. Cut the metal the length from A to B and it will make a band 3 in. in diameter.

Tires may be cut by reducing the diameter of the wheel to inches. If a tire for a 4-ft. wheel is required, place the square as if to cut a band for a 6-in diameter This will be the length for one-eighth of the tire without allowance for the weld. The weld will require three times the thickness of the metal, which therefore must be added to the total length of the band. —Contributed by T. M. Anderson, Litchfield, Ky.

How to Cement Celluloid

It is not generally known that the method used by manufacturers of celluloid novelties for cementing celluloid pieces together or for cementing paper to celluloid, consists in wetting the two surfaces to be fastened together with wood alcohol and applying pressure by means of a weight.

The method is used for attaching celluloid protecting covers to labels used in small brass frames on drawer fronts to show the contents. The celluloid is not discolored by this method of cementing, and any marks or inscriptions underneath are plainly visible.—Contributed by J. H. Harmon, Pittsburg, Pa.

To Preserve Putty

Putty, when left exposed to the air, will soon become dry and useless. I have kept putty in good condition for more than a year by placing it in a glass jar and keeping it entirely covered with water.—Contributed by E. H. Evans, Dorchester, Mass.

How to Make an Electric Soldering Iron

By R. A. McCLURE

When a current of electricity is sent through an electrical conductor, there is a certain amount of electrical energy expended in causing the current to pass through the resistance offered by the conductor. The electrical energy expended, in forcing the current through the conductor, is converted into heat energy and will heat the conductor. The amount of energy expended in this way will depend upon the resistance offered by the conductor, the current that exists in the conductor, and the time the current exists. Electrical energy is measured in a unit called the "joule," and the number of joules of electrical energy expended in heating the conductor, in any given number of seconds, is equal to the product of the resistance of the conductor in ohms, the current in amperes squared, and the time in seconds. This statement put into the form of an equation would read as follows:

Joules = $\text{amperes}^2 \times \text{ohms} \times$ time in seconds.

If all the heat generated in a conductor were retained by the conductor, its temperature would continue to rise indefinitely, but on account of the conductor losing some of the heat generated in it, its temperature will only rise to such value that the rate of giving off heat is equal to the rate at which heat is generated. If the conductor be wound around a piece of metal, the metal will be heated when there is a current in the conductor, the heat generated in the conductor being transmitted to the piece of metal.

The electric soldering iron consists of a piece of copper with a suitable winding placed about it and insulated from it, through which a current of electricity can be passed. The resistance of this winding should be of such a value that an excessive current will not exist in the winding when it is connected to the source of electrical energy. The power, in watts, needed to operate the coil will depend upon the voltage of the source of supply of electrical energy and the current in the coil, the three being in the relation indicated by the following formula:

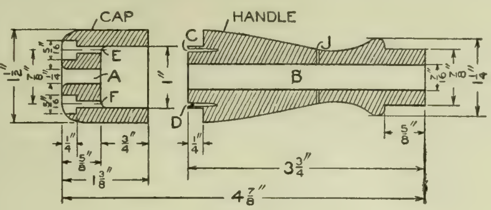


Fig. 1

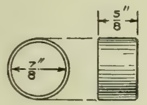


Fig. 2

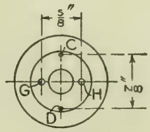


Fig. 3

Dimensions of the Wood Handle and Detail of the Ferrule and End That Enters the Cap

Watts = voltage × current, or
Watts = volts × amperes.

Thus, if it is desired to have a coil that will operate on a 110-volt circuit and not take more than 90 watts, its resistance can be calculated by dividing the power in watts by the pressure. The quotient is the current:

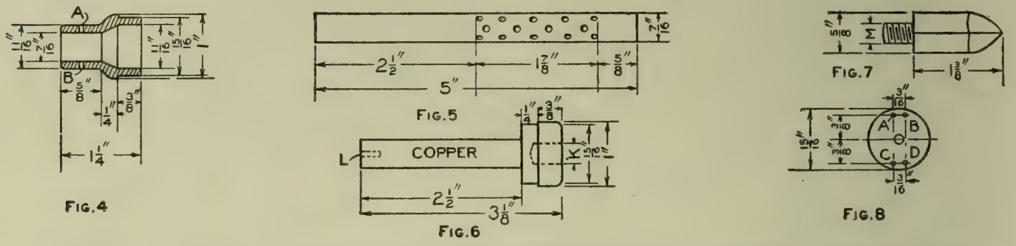
Current = $90 \div 110 = .818+$ ampere.

Further, the resistance of the coil must be such that the product of the current, in amperes, and the resistance, in ohms, is equal to the voltage of the circuit to which the coil is to be connected, or the resistance is equal to the voltage divided by the current:

Resistance = $110 \div .818+ = 134+$ ohms.

The resistance of the wire used in winding the coil should be 134+ ohms, and the wire should be of such size that it will safely carry the required current of .818+ amperes.

An electric soldering iron that will give very satisfactory results may be constructed as follows: Provide a piece of well seasoned maple, about 10 in. in length and about 1¾ in. square. From this piece of maple turn two pieces having the dimensions given in Fig. 1. The main wires leading into the soldering iron pass into the handle through the hole A, and the outside edge of this hole should be rounded, as shown, so as to prevent the wires from being injured by any sharp corners. Before drilling the hole B, procure a piece of iron or steel tubing, 5 in. in length, having an outside diameter of approximately $\frac{7}{16}$ in. The wall of this tube should be about $\frac{1}{16}$ in. thick. Now drill the hole B in the handle so that the metal tube will have to be forced into place. Do not try to make the tube fit too tightly, as it is liable to split the handle when it is driven into place. Next make a brass ferrule, as shown in Fig. 2, and drive it on the small end of the handle part. If this ferrule is made from sheet brass, its ends should be soldered, or preferably brazed. You may be able to obtain a short piece of brass tubing of just the right inside diameter and thickness to make the ferrule. The two holes, C and D, are for screws that pass through the holes E and F, and serve to hold the handle and cap together. Two other small holes, G and H, Fig. 3, should be drilled in the end of the handle part, to be used in mounting two small binding posts that are to serve as terminals for the winding of the heating coil and provide an easy means of connecting the ends of the wires that lead into the end of the handle to the winding. The writer used two pieces of brass rod, about 1½ in. long, with one end threaded, to take the nuts from the terminals of dry cells, and the other end sharpened and driven into the holes G and H until about ⅜ in. of the threaded end projected. Each of these was then provided with two small washers and two flat nuts. The hole J should not be drilled until the metal tube has been forced into the handle. The handle is now complete and should be smoothed down and given several coats of shellac.



Detail of the Tube and Parts Connecting the Wood Handle to the Copper Point, and the Copper Core for the Coil

Next obtain a piece of wrought iron and from it turn a piece having the dimensions given in Fig. 4. The narrower opening in this piece should be of such size that it will fit very tightly over the end of the metal tube shown in Fig. 5. Force one end of the tube into the opening in the wrought-iron piece to a distance of ⅝ in. Drill two small holes, A and B, Fig. 4, through both the wrought-iron piece and the tube and put a rivet in each of these holes. The outer end of the holes should be countersunk and the rivets can then be filed down level with the surface of the wrought-iron piece. The other end of the tube should be driven into the wooden handle to a distance of 2½ in. Now drill the hole J, Fig. 1, and put a metal pin through it. The part of the pin inside the tube should be cut away so as not to obstruct the opening. Then drill a number of $\frac{1}{16}$-in. holes in the metal tube, as shown in Fig. 5. These holes are for ventilating the iron, and will considerably decrease the amount of heat transmitted to the handle from the heating element.

Obtain a piece of copper of such size that from it can be cut a piece having the dimensions given in Fig. 6, with the core part $\frac{11}{16}$ in. in diameter. This piece is to form the core of the heating coil. A hole, K, about ⅜ in. in diameter, should be drilled in the large end of this piece and threaded. Drill a small hole, L, in the other end and thread it to take a ⅛-in. machine screw.

Procure a piece of steel tubing 3⅜ in. long and having an inside diameter of $\frac{15}{16}$ in. Slip one end of this tube over the piece shown in Fig. 4, and drill four small holes through it and the wrought-iron piece. Space these holes an equal distance apart around the tube and about $\frac{3}{16}$ in. from its ends. All the holes should be threaded and small machine screws provided. Slip the copper core into the other end of the steel tube and drill four holes in this end, and thread them just as was done at the other end. The tube should fit tightly on the wrought-iron and copper pieces, and the ends should be squarely against the shoulders when the holes are drilled. A soldering point can now be made as shown in Fig. 7. The threaded end M should be of such a size that it will fit snugly in the opening K in the piece shown in Fig. 6. The point can of course have any desired shape, depending upon the work for which the iron is to be used.

The point of the iron, and the core can be made in one piece, which under ordinary conditions will, perhaps, give the best results, as the point cannot come loose and the heat can be better transmitted to it from the heating element.

The iron is now complete with the exception of winding the coil and, if desired, finishing the metal parts so that they will present a little better appearance. Cut from some heavy sheet mica, about $\frac{3}{32}$ or ⅛ in. thick, a washer having an outside diameter of $\frac{15}{16}$ in. Drill a hole in the center of this washer so that the small machine screw that is to fit into the hole L, Fig. 6, will just pass through it. Drill four other holes, A, B, C and D, in the washer, as shown in Fig. 8. Obtain a small metal washer about ⅜ in. in diameter with an opening in it of the same diameter as the opening in the center of the mica washer. Now fasten the mica washer to the end of the copper core with the machine screw, placing the small metal washer between the mica washer and the head of the screw. After the screw has been drawn up tightly drill a small hole through the metal and mica washers, near the edge, and about ⅜ in. into the copper core. Drive a small brass or copper pin into this hole which will serve to prevent the mica washer from turning around. The object of preventing the mica washer from turning around, is to give a solid anchorage for the terminals of the coil and the leads that are to be carried back through the handle. The leads from the coils to the back end of the handle should be insulated with asbestos as any other kind of insulation will not withstand the heat. These leads should each be about 10 in. in length. Then obtain about 40½ ft. of No. 28 gauge bare Superior resistance wire. This is a special kind of resistance wire which at that gauge has a resistance of 3.32 ohms per foot. Another kind of resistance wire known as "Ia Ia" has a resistance of 1.89 ohms per foot for No. 28. If this kind of wire be used, 71 ft. will be required. The coil is wound as follows: Pass the end of one of the asbestos-insulated leads back and forth through two of the small holes in the mica washer, that are near each other, a number of times, allowing about 1 in. of free wire to protrude through the washer toward the inner part of the spool. Attach one end of the resistance wire firmly to the end of the terminal wire. Then wrap around the copper core a thin sheet of mica and start winding the resistance wire on. The spacing between the adjacent turns should be approximately equal to twice the diameter of the wire. Do not run the winding nearer the end of the core than ¼ in. Place a thin sheet of mica between each layer of the winding and continue the winding until the required

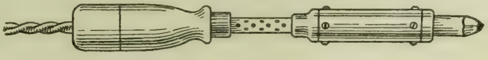
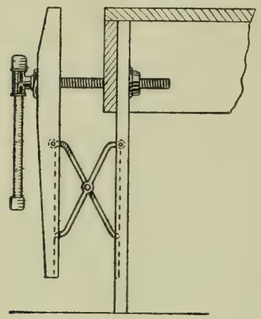


FIG. 9

The Assembled Parts Which Make Up the Complete Electric Soldering Iron Ready for the Current length of wire has been used. The outside end can be terminated just as the inner end, and the winding is complete. Now place the coil inside the metal tube, shoving the leads back through the handle. Fasten the ends of these leads under the binding posts. Procure a piece of lamp cord and an attachment plug. Attach the plug to one end of the cord and pass the other end through the opening A in the handle. Tie a knot in the cord inside the handle and fasten the ends under the binding posts. Two slender screws, at least 2 in. in length, should be provided to fasten the handle and cap together. The now completed iron will appear as shown in Fig. 9.

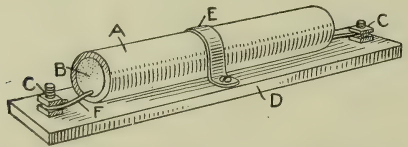
A Carpenter's Vise Adjuster



The accompanying sketch of a vise adjuster was redrawn from an illustration given by a correspondent of the American Carpenter and Builder, which he claims to be superior to the usual adjustment bar of a carpenter's vise. The vise will always have parallel jaws in any position and there are no pins to set. The substitute bar is made of metal, similar to a pair of shears, the upper ends having eyes to fasten them permanently to the bench leg and vise jaw, while the lower ends slide in grooves as shown by the dotted lines.

A Homemade Fuseblock

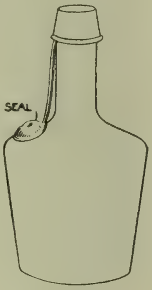
In almost every steam plant there are a number of discarded water-gauge glasses and in one instance the engineer used them to make electric fuse holders. The glasses were cut into short pieces, A, and fastened to a base, D, made of fiber, wood or hard rubber, with a clip of metal, E. The fuse wire F was run through the glass and fastened at the ends with small bolts, CC. The space B is filled with plaster-of-Paris. When the fuse burns out, it takes but a few moments to unscrew the clip and put in another glass tube inclosing a perfect fuse. The burned-fuse receptacles may be saved and filled again.—Contributed by Jas. E. Noble, Toronto, Ont.



The Barrel of the Fuse Block Consists of a Water-Glass Gauge Filled with Plaster over the Wire

Wax Seals on Glass

In a wholesale house where I worked we had considerable trouble in making wax seals adhere to a glass bottle as shown in the sketch. The seals would break and come off in shipping. After considerable experimenting we found that by pasting a circular piece of paper, a little smaller than the seal, on the bottle and then covering it with the hot sealing wax, the seal would stay permanently.—Contributed by Fred Schumacher, Brooklyn, N. Y.



Stop for a Typewriter Ribbon

Owning a typewriter on which the reversal of the ribbon was not automatic, I was often troubled by the ribbon running off one spool or the other before I noticed it, necessitating a tedious job of rethreading the ribbon through the guides and running it onto the empty spool.

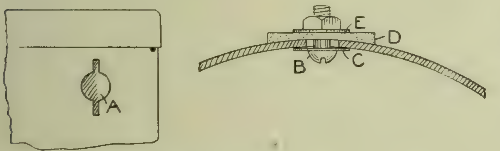
This trouble was overcome by simply putting a small clasp on the ribbon near the end so that it was impossible for the ribbon to run off the spool, as the clasp would stop further progress when it reached the guides. It is also quickly noticed as soon as it approaches the guides, thus reminding the user to reverse the ribbon.

Any small article may be used, such as a brass paper clip, or any other article that will not interfere with the winding of the ribbon on the spools, but will be easily seen. This simple device will soon prove its usefulness to any user of a typewriter of this kind.—Contributed by T. L. Parker, Wibaux, Mont.

Repairing Leak in a High-Pressure Tank

The inside of a tank, being used under city-water pressure, was inaccessible, due to the construction. A hole developed in one side, a little larger than ⅛ in. and about 1 in. from the top. The hole could not be soldered, and it was finally repaired in the following manner:

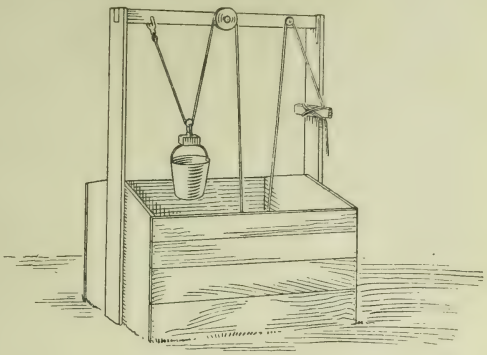
It was first enlarged so that the head of a ⅛-in. stove bolt would easily slip through, and a longitudinal slot then cut across as shown at A, this slot being long enough to allow a washer to be slipped through. A piece of small wire was securely fastened to the screw end of a ⅛-in. stove bolt, B, to hold it while the head of the bolt was stuck into the tank, and a washer, C, passed over the wire and pushed inside the tank sideways through the slot. A piece of thick rubber gasket, D, with a hole a little smaller than the body of the bolt, was made into a washer large enough to cover the slot. This washer was secured in place by a large iron washer, E, which was held with the nut.—Contributed by H. A. Sivas, Columbus, O.



The Shape of the Hole Cut in the Tank to Admit the Screw Head and Washer

Drawing Water from an Open Well

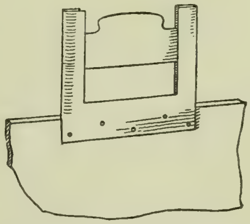
The illustration shows a good rig for drawing water from a well. While the full bucket is being raised the empty one goes down. In this manner nothing but the water is lifted, as each bucket counterbalances the other. A swivel should be put in the end of the rope to keep it from twisting. The cleat is used to take up or let out the rope as the water rises or lowers in the well.



Equalizing the Rope and Counterbalancing the Buckets to Make It Easy to Draw Water

Paintbrush Cleaner

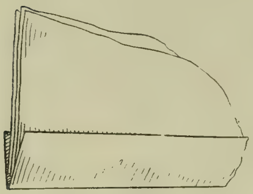
A very handy device for use in a paint shop is a brush cleaner as shown in the sketch. It is made of two pieces of sheet iron which are attached to a vat or tub. The brush is placed between the uprights and the piece between them is pressed down on the brush as it is drawn through. It readily removes all surplus paint in a brush.



Softening Leather in Gloves and Boots

The leather in high-top boots and gauntlet gloves may be softened and made waterproof by the use of plain mutton tallow. Apply hot and rub in well with the fingers.

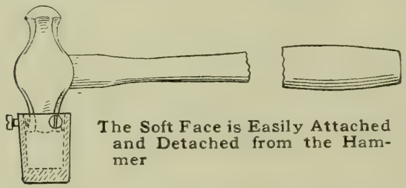
Inserting Manifold Papers in a Typewriter



When inserting more than one sheet of paper in a typewriter for manifold work it is difficult to keep the sheets together and in proper relation to each other. If a small strip of paper is folded V-shaped and placed over the ends of the paper sheets and then inserted in the machine, it will keep them in their proper places.

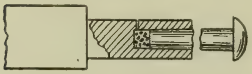
Soft Faces for Hammers

A soft-metal hammer is sometimes useful, but the kind of work for which it is required hardly warrants the expense of buying a copper hammer, says the Model Engineer, London. The substitute shown in the sketch is a copper or soft-brass casting fitted on the face of the hammer and fastened with three screws. The pattern for the casting can be turned hollow, no core being necessary. If a lead cap is required, it should be cast thicker on the end.



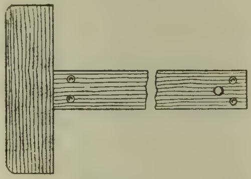
The Soft Face is Easily Attached and Detached from the Hammer

Removing a Broken Pin



When overhauling the transmission of an automobile it was found that the thrust button in the end of the drive shaft was broken off flush with the end of the shaft. As the button is hardened, it was out of the question to drill it out without annealing. No fire was handy, and even if there had been, the heat would destroy the finish on the bearing. It was decided to remove the button as follows: A hole was drilled into the shaft at the end of the button shank. The small space back of this was filled with gunpowder which was fired, successfully removing the broken button end.—Contributed by Frank C. Schmidt, Dayton, O.

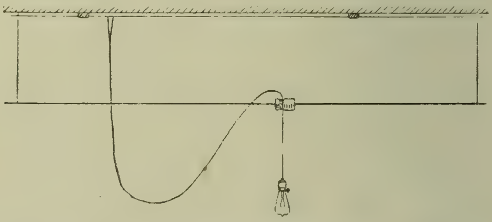
To Prevent a T-Square from Soiling Drawing



When working over a drawing for several days, the instruments soon soil the drawing and it becomes difficult to read the dimensions. The T-square is one of the instruments that causes the most of this kind of trouble. But if thumb tacks are inserted in the blade of the T-square, as shown in the sketch, the heads of the tacks will raise the blade slightly from the surface of the paper or tracing, and no soiling of the drawing will result.—Contributed by H. L. Prout, Cleveland, O.

A Movable Droplight

A very handy way to support an electric droplight, for the workbench or in front of shelving in a store, is to attach the cord to a porcelain insulator which is slipped on a wire stretched in the place desired. The insulator can be slid along the wire to any point where the light is wanted.—Contributed by M. E. Duggan, Kenosha, Wis.

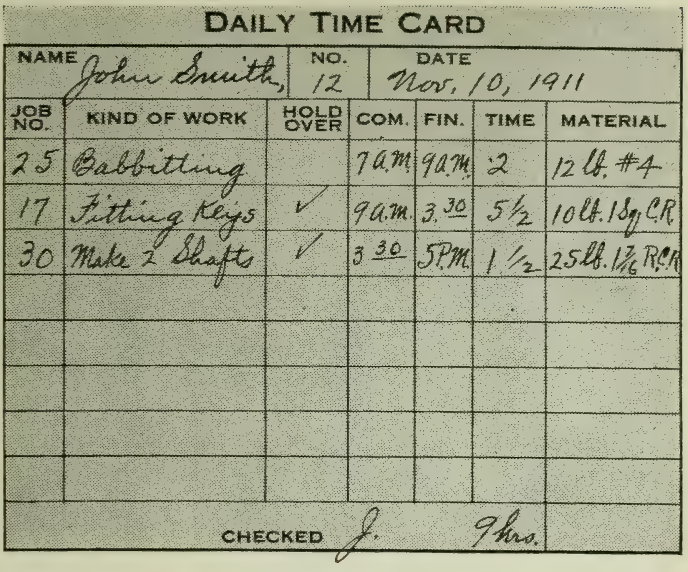


The Cord of the Droplight is Attached to a Sliding Porcelain Insulator

A Cost System for Small Shops

The card system shown in the illustrations is for a small machine shop, but with slight changes it could be used for factories as well. There is a great deal of waste caused by failure to carefully account for every item of labor and material, and frequently business failure is the result.

In a small shop, the cost of putting in and maintaining a complete card system is prohibitive, yet some method of accounting is necessary. The system here illustrated was made up for this purpose, and from years of ex-



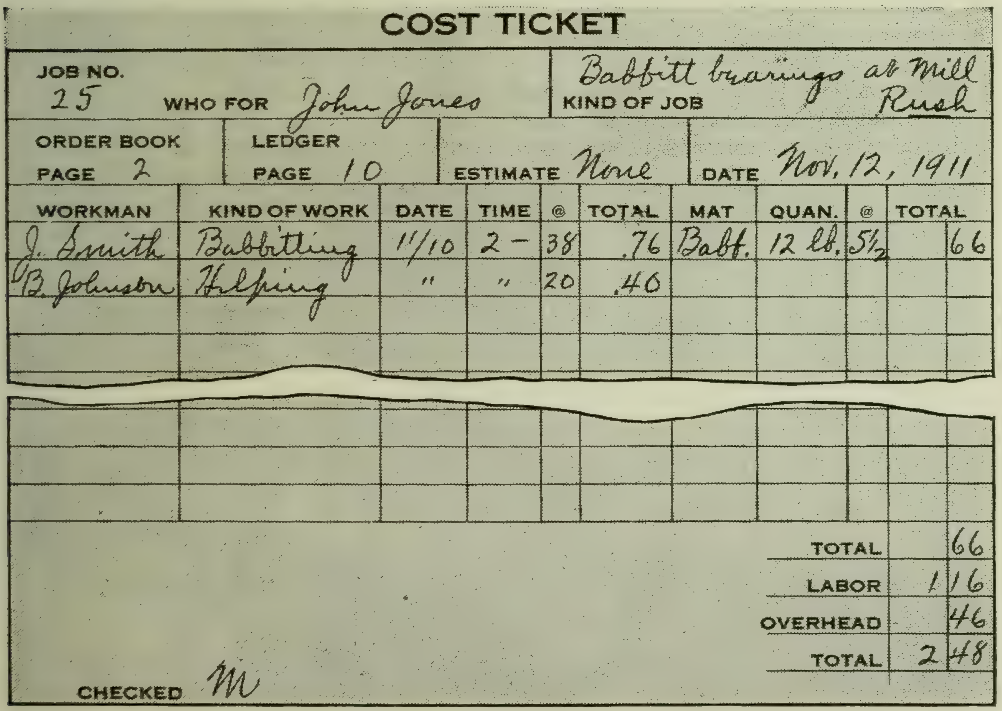
DAILY TIME CARD

NAME John Smith, NO. 12 DATE Nov, 10, 1911

JOB NO.	KIND OF WORK	HOLD OVER	COM.	FIN.	TIME	MATERIAL
25	Babbitting		7 a.m.	9 a.m.	2	12 lb. #4
17	Fitting Keys	✓	9 a.m.	3.30	5½	10 lb. 1 Sq CR
30	Make 2 Shafts	✓	3 30	5 P.M.	1 ½	25 lb. 1 7/16 R.C.R

CHECKED J. 9 hrs.

This Card is Kept by the Employe as the Work Proceeds and is Turned over to the Foreman at the End of the Day



COST TICKET

JOB NO. 25 WHO FOR John Jones

KIND OF JOB Babbitt bearings at Mill Rush

ORDER BOOK PAGE 2

LEDGER PAGE 10

ESTIMATE None

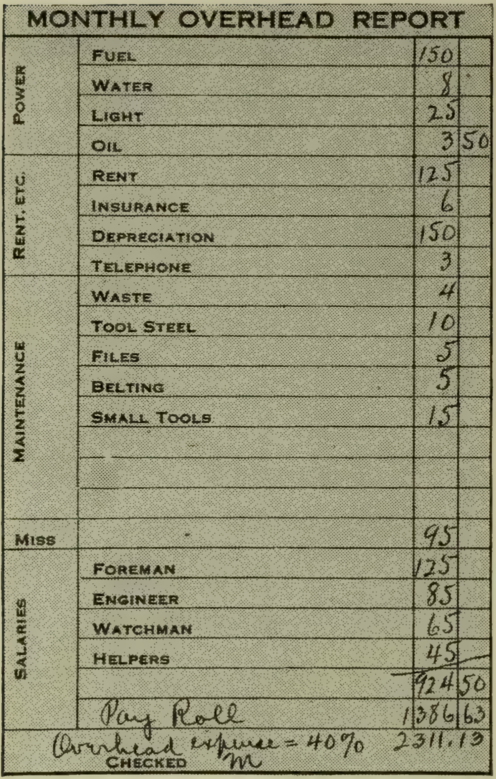
DATE Nov, 12, 1911

WORKMAN	KIND OF WORK	DATE	TIME	@	TOTAL	MAT	QUAN.	@	TOTAL
J. Smith	Babbitting	11/10	2 –	38	.76	Babt.	12 lb.	5½	66
B. Johnston	Helping	"	"	20	.40				

TOTAL 66
LABOR 1 16
OVERHEAD 46
TOTAL 2 48

CHECKED M

All Time and Material are Posted on the Cost Ticket Which Compiles All Items on One Job

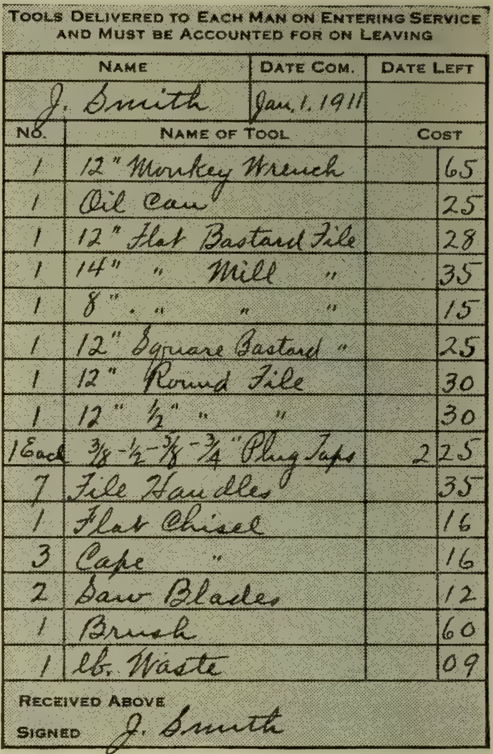


MONTHLY OVERHEAD REPORT

POWER	FUEL	150	
	WATER	8	
	LIGHT	25	
	OIL	3	50
RENT, ETC.	RENT	125	
	INSURANCE	6	
	DEPRECIATION	150	
	TELEPHONE	3	
MAINTENANCE	WASTE	4	
	TOOL STEEL	10	
	FILES	5	
	BELTING	5	
	SMALL TOOLS	15	
MISS		95	
SALARIES	FOREMAN	125	
	ENGINEER	85	
	WATCHMAN	65	
	HELPERS	45	
		924	50
	Pay Roll	1386	63
Overhead expense = 40%		2311.13	

CHECKED M

Items That cannot be Charged to a Customer are Entered on This Card



TOOLS DELIVERED TO EACH MAN ON ENTERING SERVICE AND MUST BE ACCOUNTED FOR ON LEAVING

NAME	DATE COM.	DATE LEFT
J. Smith	Jan. 1. 1911	

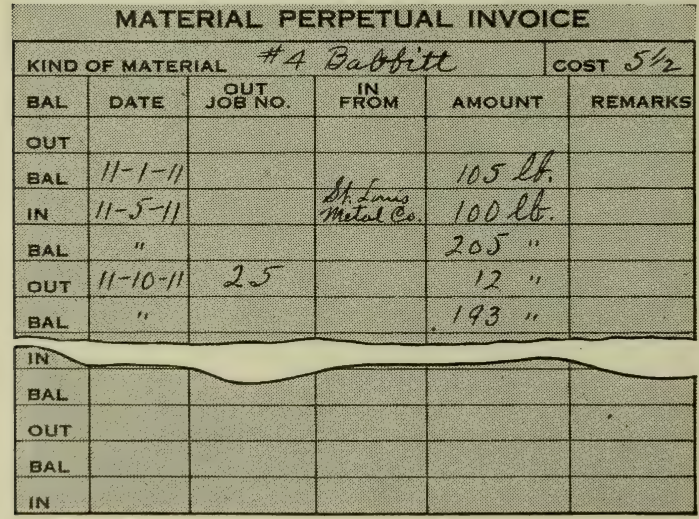
NO.	NAME OF TOOL	COST	
1	12" Monkey Wrench		65
1	Oil Can		25
1	12" Flat Bastard File		28
1	14" " Mill "		35
1	8" " " "		15
1	12" Square Bastard "		25
1	12" Round File		30
1	12" ½" " "		30
1 Each	3/8-½-5/8-¾" Plug Taps	2	25
7	File Handles		35
1	Flat Chisel		16
3	Cape "		16
2	Saw Blades		12
1	Brush		60
1	lb. Waste		09

RECEIVED ABOVE

SIGNED J. Smith

All Tools are Charged to a Workman When He First Commences Work, and They must be Accounted for When He Leaves the Company's Employ

perience in the jobbing business, has been found not to interfere in the least with the use of a time-recording clock from which to make up the pay roll. In connection with these cards a record book should be kept, stating when a job was taken in and when it is to be delivered, together with all other details connected with it, for future reference.



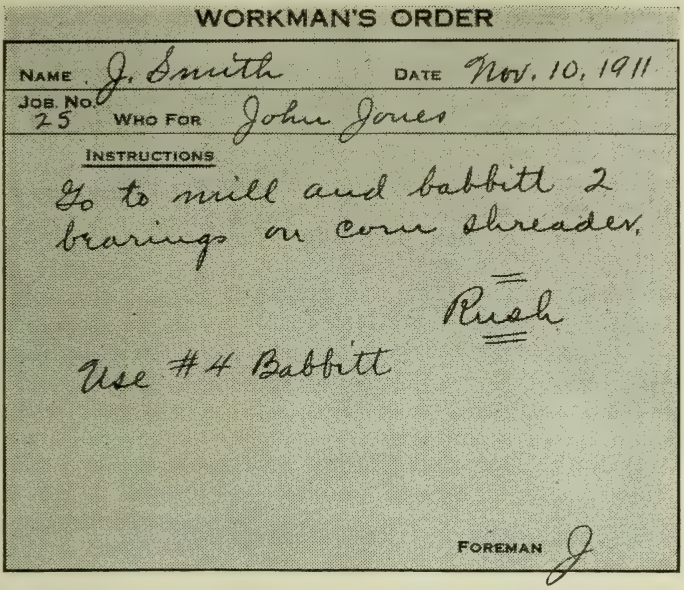
MATERIAL PERPETUAL INVOICE

KIND OF MATERIAL #4 Babbitt — COST 5½

BAL	DATE	OUT JOB NO.	IN FROM	AMOUNT	REMARKS
OUT					
BAL	11-1-11			105 lb.	
IN	11-5-11		St. Louis Metal Co.	100 lb.	
BAL	"			205 "	
OUT	11-10-11	25		12 "	
BAL	"			193 "	
IN					
BAL					
OUT					
BAL					
IN					

Items of Stock Coming In or Going Out are Entered on Cards Which Thus Form a Perpetual Invoice

The daily time card is kept by the employe as the work proceeds, and is turned in to the foreman at the end of the day. After being checked up by the foreman, the card is turned in to the office to be posted on the cost ticket. The card has a place for the workman's name and number, the date, job number, kind of work, etc. If the job is finished,



WORKMAN'S ORDER

NAME J. Smith DATE Nov. 10, 1911

JOB. NO. 25 WHO FOR John Jones

INSTRUCTIONS

Go to mill and babbitt 2 bearings on corn shredder.

Rush

Use #4 Babbitt

FOREMAN J

Instruction Card Giving Details on a Job; Made Out by the Foreman

commenced or held over, a check mark is placed under the respective headings.

Time and material are posted from the daily time card to the cost ticket, after which the percentage of overhead and running expense is added. The sum of these figures shows the total cost of the job. If a piece of work is done for the shop, it is accounted for on the daily time card and sent through the regular routine just as if it were for a customer.

A monthly overhead report or factory-expense card collects all charges of labor, material, expense and permanent equipment of any kind that cannot be charged to customers' work.

Another card is kept for each workman, showing the tools given him on entering service, and he must account for the same kind and number on leaving the factory. The workman receipts for the tools on the card, and it is filed away. Tools worn out and discarded in service are replaced without charge to the workman, but if lost or destroyed by carelessness, the workman must pay the actual cost of the tool. When he leaves the employ, the card is checked up before he is finally paid off.

Material perpetual invoice or stock cards are kept. These cards should be arranged in a box with a bottom sufficiently inclined to allow the kind of material written on the top to be exposed to view, for convenience in locating the desired card. This card serves as a double check on material going out and also as a perpetual stock invoice. The space at the top is for the kind of material with cost, and the columns show how much is taken out, as well as how much was received, where it was received from, and when.

An order card is issued to the workman to instruct him on a job. The foreman makes out this card, and the workman follows the instructions and uses it in making up his time card.

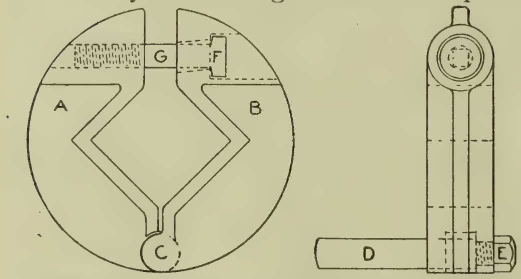
Reviving Old Printing-Press Rollers

Printers of the days when each office made its own rollers probably know of it, but of the present generation who buy their rollers ready-made only few may be aware that washing the rollers carefully and then covering them with thin molasses will materially soften and freshen them. I was once member of an office force who had difficulty in convincing the proprietor that too old rollers caused the poor print on the paper. After the new rollers were finally ordered, we washed the old rollers and covered them with molasses, which was left on for a day or so. When put into commission again that week, the result was nearly equivalent to that obtained with new rollers, and they remained in good condition until the new rollers were received and sufficiently seasoned to be placed on the press.

The job man who feels hurt because the "boss" won't provide him with new rollers to enable him to produce good work, can, with a couple of cents' worth of molasses and a few minutes' time at night, provide himself with pretty good rollers for the next morning. In the old days rollers were made principally of molasses and glue, and molasses or some equivalent doubtless forms one of the main ingredients in their construction today.—Contributed by C. W. Goddard, Muskegon, Mich.

A Lathe Dog that Clamps on the Work

The accompanying illustration shows a safety lathe dog with no protruding screw to catch the clothing or to mar the work being turned.



The Form of the Dog is Circular with no Projections to Catch in the Clothing

The pieces A and B are jointed at C and are held together with a stud, D. The locknut E keeps the stud tightly in place. The body of the screw F is made square at G so it may be turned with a wrench. This screw is used to clamp the dog onto the work.—Contributed by F. G. Marbach, Cleveland, O.

Temporary Repairs on Gasket Blowout on Engine Cylinder

A part of a gasket was blown out of the joint on the cylinder head of an engine driving a dynamo for electric lighting. The engine could not be stopped for repairs, so a temporary repair was made as follows: A piece of cloth was folded to form three layers and placed over the leak. A piece of large copper wire was wound around the cylinder and cloth several times just over the leak, and the ends were twisted up tightly with a pair of pliers. This stopped the leak so that the engine was run seven hours until it could be stopped for permanent repairs.—Contributed by Jonathan W. Reynolds, Philadelphia, Pa.

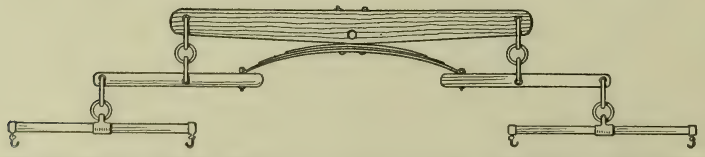
Eyelets for Belts

If eyelets, such as used in shoes, are put into the lace holes of a belt, the belt will last much longer. The eyelets, which may be taken from old shoes, will prevent the lace from tearing out. I have used this method on several kinds of belts, always with entire satisfaction.—Contributed by Irl R. Hicks.

A Shock-Absorbing Doubletree

When a team is pulling a heavy load over a rough road or pavement, it is subject to repeated and sudden shocks which cause much unnecessary fatigue. The sketch shows how to make a doubletree that will absorb all shocks and sudden jerks and prevent sore shoulders.

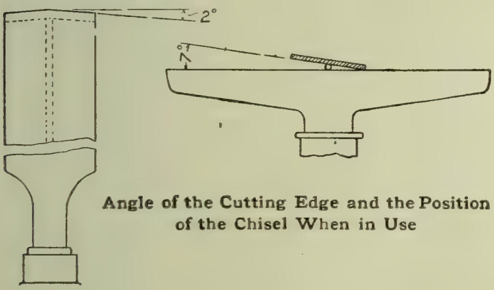
The spring may be one taken from an old buggy. All teamsters that care for their horses and want them to stand up to heavy work without constantly having sore shoulders,



An Old Buggy Spring is Fastened to the Center of the Doubletree So That the Ends will Engage the Arms to Which the Singletrees are Fastened should make and use a doubletree like the one shown in the sketch.

Wood-Turning Chisel

The sloping edge of a wood-turning chisel must be held at a very slight angle so that the chips may be cut away without tearing from the work. It is quite tiresome to hold a chisel in this position when working on a large piece. I overcome this fatigue by soldering a wire of the proper size to the under side and in the center of the chisel blade. This will give the right angle to the chisel edge, no matter which way it is cutting. The angle of tilt should be 7 deg., and the slope of the cutting edge ground to a 2-deg. angle. The angle gives the chisel a shearing action, and the corners will not dig into the grain of the wood.—Contributed by C. M. Graham, Waterloo, Ia.

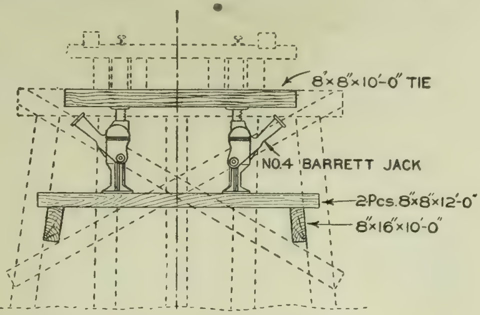


Angle of the Cutting Edge and the Position of the Chisel When in Use

Raising Trestles Quickly

In a case where several pile bridges had to be raised from 8 in. to 28 in. quickly in order not to interrupt the traffic, the following method was used by a correspondent of the Railway Age Gazette.

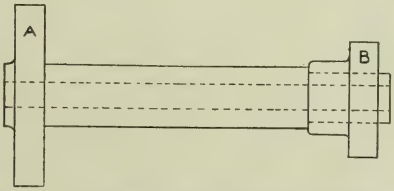
Second-hand 8 by 16-in. timbers were placed longitudinally on the pile, bracing the entire length of the bridge, as shown in the sketch. Ties, 8 by 8 in. by 12 ft. long, were placed on these stringers, and jacks set on them, while 8 by 8-in. by 10-ft. ties were laid on the head of the jacks, under the track stringers, of which there were three under each rail. The longest bridge raised was a 19-span structure, 243 ft. long, with an average height of 16 ft. This entire bridge was raised with eight jacks, and a safe run off made in 10 hours. Dowels and lining bolts were put in place and all material picked up within this time. It required one day to place 8 by 16-in. timbers the entire length of the bridge.



The Timbers on the Trestles to Support the Jacks for Raising the Tracks

Repairing a Broken Back Gear on a Lathe

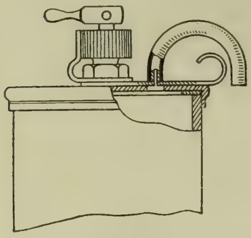
The quill pinion B on the back gear of a foot-power lathe had several teeth broken out of it, and, owing to the lightness of the gear, it was not advisable to make repairs with pin teeth. The entire back gear quill with the two gears, A and B, was in one piece, and the owner thought he would have to buy a new one, until he hit upon the idea of shrinking on a piece of steel. This was done, the piece being first cut with the same number of teeth. The stem of the quill was turned down and the rim with the teeth shrunk on, and the part was as good as new. The dotted lines in the sketch indicate the bore of the quill and the end turned to receive the new gear.—Contributed by Donald A. Hampson, Middleton, N. Y.



Form of the Back Gear of a Lathe Which was Repaired

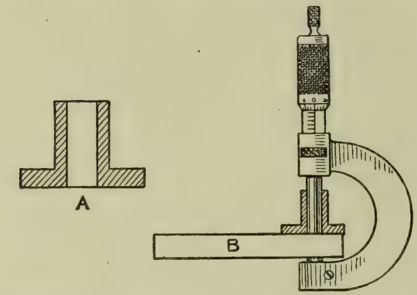
Oil-Cup Vent Guard

The ordinary glass sight-feed oil cup has a slide on top to permit filling, and the slide has a hole for a vent, says Power. To prevent dirt and grit working in through the vent hole, bend a piece of small copper tubing, having a $\frac{1}{16}$-in. hole, into a U-shape and solder it to the slide, with the hole in the tube over the vent in the slide. This will give the necessary vent and the dirt and grit falling on the cup can be wiped off—not in.



How to Lap a Micrometer

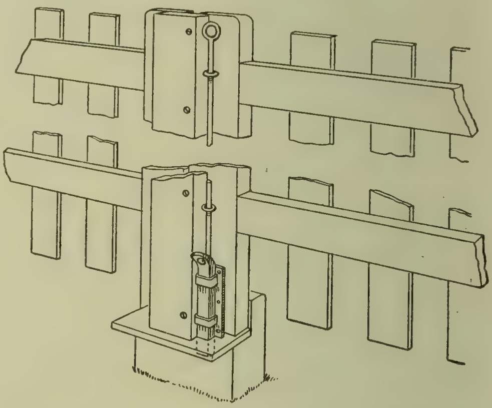
When the measuring surfaces of a micrometer become worn so that they do not measure accurately, the micrometer must be thoroughly washed in gasoline, then adjusted so that it will measure one-half thousandth of an inch over size, and a collar fitted to lap the end of the spindle true. The collar is turned up as shown at A, hardened, and the hole lapped so that it will be a snug fit on the upper spindle. Place the collar on a mandrel or plug and grind the bottom face. After this is done, put the collar on the upper spindle and procure a flat piece of cast iron with the upper and lower sides absolutely parallel. Use the cast-iron block for lapping. Lap with flour of emery and oil until the micrometer measures accurately. The little collar serves to hold the micrometer in the right position while lapping. —Contributed by Chas. Homewood, Waterloo, Ia.



The Shape of the Collar and Manner of Using It in Lapping a Micrometer

Latch for Heavy Double Gates

The sketch illustrates a very substantial and easy method of keeping heavy swinging gates closed. The device consists of a heavy door bolt, for sale at almost any hardware store, which is fastened to the gate and connected to a lifting rod as shown. The lifting rod is of iron about ¼ in. in diameter, which is securely fastened to the bolt and extended up to the top of the gate. This rod is held in place with screweyes. An iron plate, about $\frac{3}{16}$ or ¼ in. thick, having a hole in it a little larger than the bolt and so adjusted that the bolt will fit into it when the rod is pushed down, is firmly screwed to the middle post of the gate as shown.—Contributed by Otto Kling, Ada, O.



Latch, Bolt Plate, and Lifting Rod as They are Attached to the Gate

Repairing Old Anvils

Heat the anvil sufficiently to draw the temper and let it cool slowly as when annealing steel. Plane or mill the surface and polish it smooth. Heat the anvil and caseharden. An old anvil can be made as good as new in this manner.

Tile Sewer Construction

By GEO. M. PETERSEN

Part II

Shoring and Bracing

When excavating in unstable ground or where there are heavy surface loads, which are likely to cause the sides of the trench to cave in, the sides are braced at 5 and 10-ft. intervals, as shown in Fig. 8. The most common method of bracing by using jackscrews and pieces of pipe for spreaders is shown at A, while at B is shown a common makeshift for the jack—a piece of 2 by 4-in. material, driven in tightly. The usual position of the uprights is shown in C, while D illustrates a diagonal method which is very satisfactory if continuous bracing is necessary for any great distance, as in heavy clay.

On excavations in sandy or loam soil it is sometimes necessary to build a box around the trench. This is called "shoring" and consists of a number of 2 by 4-in. pieces, about 5 ft. long, which are made up into a framework to hold the retaining boards. The trench must be wide enough at the start so that these pieces may be placed and driven down as the excavation progresses. Figure 9 shows this construction clearly. The pieces SS are not nailed to the boards, but are held in place by jackscrews or wedged in as shown in Fig. 8, at A and B, so that the boards can be moved.

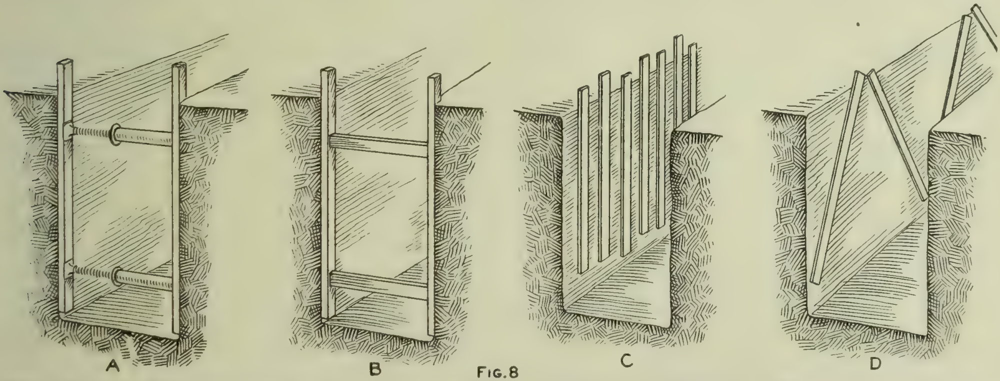


FIG. 8

Two Methods of Bracing, and the Usual Positions of the Uprights in Holding the Shoring Boards Against the Trench Sides to Prevent Curving

Laying the Tile

Begin at the trunk or branch sewer. Break into the manhole and cement a piece of sewer tile into the opening, the bell of the pipe being laid uphill and to grade, as shown in Fig. 10. Oakum and cement are then placed on the invert, or bottom, of the bell and another tile placed in it. Oakum is then packed in all around the joint and mortared up with a cement mortar. The tile is lowered into the trench with the aid of a tile hook, illustrated in Fig. 11. The size of this hook naturally varies with the size of the tile with which it is used. The smaller sizes of tile, up to 24 in., can be lowered by hand, but if there are a great quantity of 24-in. tile, or larger,

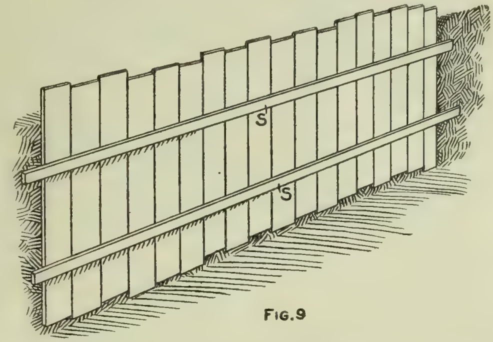


FIG. 9

The Shoring as It is Placed on One Side of a Trench in Sandy or Loam Soil it would be cheaper in many instances to construct a tripod, as shown in Fig. 12, and lower the tile with the aid of a tackle. On very large jobs, this tripod can be mounted on wheels and pushed along by hand on boards or light rails. Specifications for sewers in large cities invariably call for a covering of 6 in. of clean, fine sand, thoroughly tamped around the tile. The sand acts as a cushion between the tile and the hard earth to prevent the vibration of heavy traffic from reaching the tile.

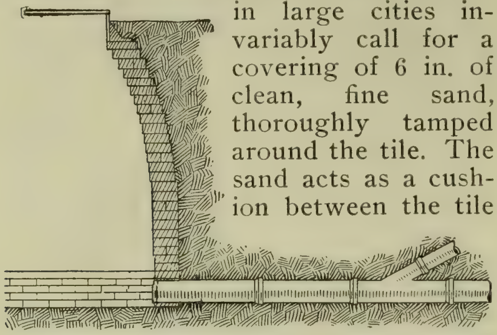


FIG. 10

The Tile is Laid with the Bell End Uphill, Commencing the Work at the Trunk or Branch Sewer

When a manhole stake is reached, a break is left in the tile run for 5 ft. except at corners, where 4½ ft. on the short side will be sufficient. When starting a new section, the first piece of tile is leveled at both ends with the aid of the sight rod, the crosspiece of which is sighted in between the rangers on either side. After the start is once made, the bell end of the tile is the only part that is leveled, as the opposite end must be right in the bell which was previously leveled.

When laying tile on branch sewers, house connections are placed for each lot. It is the duty of the inspector to locate these connections for the foreman and also to keep a record of the exact location of each connection. The inspector must also check the rangers and oversee the work in general. The house connections are ordinary pipe with, usually, a 6-in. branch, as shown in Fig. 13. They are laid with the branch facing up grade and on the side of the trench from where it is to be connected. Connections should be so laid out that when the house connection is laid, it will meet the sewer connection with a long swing, as a sharp turn is liable to become clogged. When the size of the tile is changed, and this is done very often in branch sewers, the change is made at the manhole.

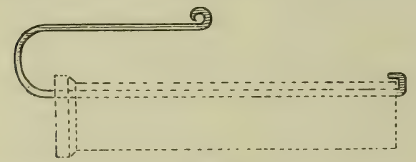


FIG. 11

Each Tile is Lowered into the Sewer with the Aid of a Tile Hook

Manholes

Manholes are also used in turning corners and are located from 150 to 200 ft. apart on the straightway run. The manholes are necessary at these points as they afford the only way of cleaning out the sewer if it should become clogged with dirt and refuse. The sewer manholes are constructed of brick, as shown in Fig. 14, but, of course, the dimensions will vary slightly to meet different conditions. The invert is constructed to fit the tile which comes into it. If the incoming tile is 12 in. and the outgoing 15 in., the manhole invert will be shaped to accommodate both tiles. This invert should be constructed of two courses of brick, but it is seldom that more than one course is used. The branch walls are of stone, and usually old curbstone is used for making them. On a sewer with cuts varying from 7

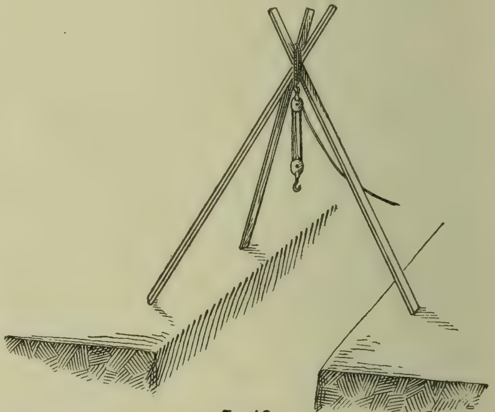


FIG. 12

Large Tile, 24-In. or More, may be Lowered with a Tripod Set over the Trench to 10 ft., the manholes will require from 800 to 1,100 bricks each, and a first-class manhole builder with three or four laborers should easily build two or three a day.

Back Filling

The proper back filling of the trench is by far more difficult than the excavation. This is on account of the depth of trench, which is seldom less than 7 or 8 ft. When running water is at hand the work is greatly simplified, as the trench can be "puddled." The operation consists of back filling about 2 ft. of earth and then flooding the trench until there is about 6 in. of water on top. Throw in more dirt, pour in more water, and so on until the trench is filled completely. The earth should then be piled up on top of the trench before leaving the work.

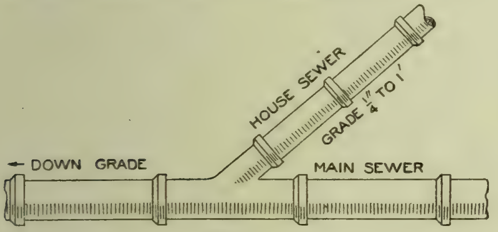


Fig. 13

Tile for a House Connection as It is Laid to Enter a Main Sewer

If this work is properly done the earth should be piled 1 in. in height for each 1 ft. in width. This will fill up any settling that may take place.

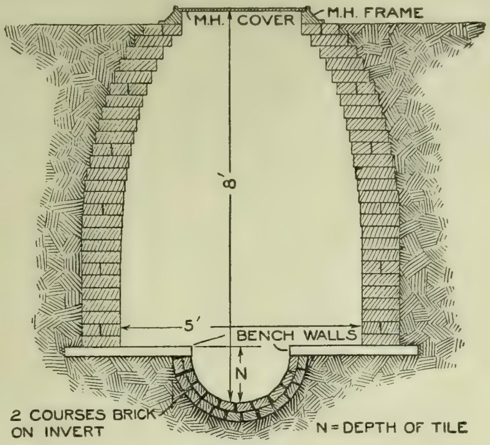


Fig. 14

Detail of a Manhole; Dimensions Vary Slightly to Meet Different Conditions

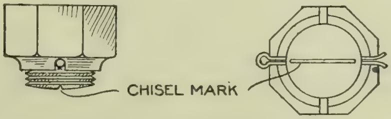
If no water is at hand, the earth must be tamped in with a tamper. The tampers should be the kind used as paving pounders. Earth is thrown into the trench from 1 to 2 ft. deep and then it is well tamped with the heavy pounders. When a trench is back filled in this manner, all the remaining dirt from the excavation should be piled on top, no matter how well tamped, as it will sink and settle a great deal more than if it had been "puddled."

To Remedy Flickering Lights on a Gas-Engine-Driven Dynamo

A 500-watt, 110-volt dynamo, driven by a hit-and-miss gasoline engine, gave trouble by the lights flickering. A balance wheel attached to the dynamo did not reduce the flickering. The dynamo was driven by an endless belt, with the grain or rough side to the pulley face. The trouble was remedied by turning the belt over so that the smooth side ran on the pulley. This arrangement allowed the belt to slip a little at each impulse of the engine, which caused the dynamo to run without a hitch and consequently the lights to burn evenly.—Contributed by R. A. Frear, Ithaca, N. Y.

To Mark the Through-Way of a Cotter

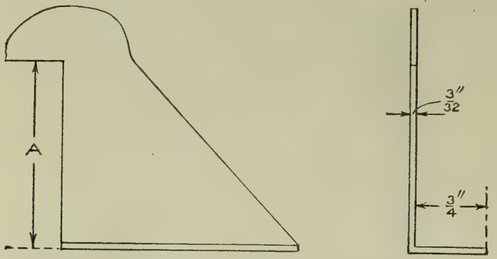
While lying on my back under an automobile I found it very difficult to locate the cotter holes. This was easily overcome by cutting a small mark with a chisel edge across the bolt end in the same direction as the hole in the bolt. A hole thus marked can be easily located.—Contributed by Chester L. Cobb, Portland, Me.



The Chisel Cut on the End of the Bolt Shows the Direction of the Hole

A Lathe-Tool Gauge

The gauge is made of $\frac{3}{32}$-in. sheet metal in the shape shown in the sketch. It is used to set lathe tools

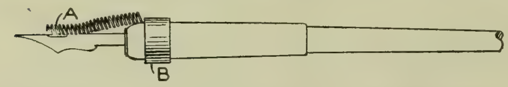


The Gauge is Used on Top of the Tool-Post Slide, to Set the Lathe Tool

centrally. Make the distance A equal to the distance from the lathe center to the top of the tool-post slide.—Contributed by Chas. Hattenberger, Buffalo, N. Y.

Reservoir Pen for Drawing Ink

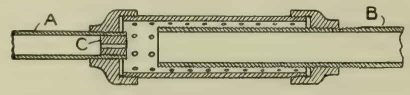
The reservoir pen shown in the sketch has the advantage of being equally useful for writing or India-ink work, says a correspondent of American Machinist. It is made of a coil of fine music wire, silver plated for writing ink, and attached to the penholder with a spring clamp. A silvered banjo string will do very well. The flow of ink to the point can be regulated by sliding the coil up or down on the pen point.



The Flow of Ink can be Regulated by Sliding the Wire on the Pen

A Water Ejector

The device shown in the accompanying sketch is an effective means for emptying flooded cellars, trenches, etc. City-water pressure is the force used. As may be seen, it is made of a few pipe fittings, the body being of 1¼-in. pipe with a 1¼ to ¾-in. reducer at one end and 1¼ to ½-in. reducer at the other. The pipe is perforated by a number of ⅛-in. holes. The pipe A, for connection to the water pressure, is ½ in. and fitted with a ⅜-in. plug, C, having a ⅛-in. hole drilled through its center. The delivery pipe B has a long thread for adjustment to obtain the proper gap between the jet and delivery. When using the ejector it must be entirely submerged in the water it is to remove.—Contributed by J. J. O'Brien, Buffalo, N. Y.



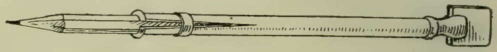
Cross Section of the Ejector Which is Made Entirely of Pipe and Fittings

Lead-Pencil Holder

A draftsman or illustrator constantly realizes the need of some device enabling him to use all of the drawing pencil. No drawing pencil less than 4 in. in length should be used and, considering their cost, it is rather expensive to waste the 6 or 7 cents' worth of the pencil which is practically useless without a holder of some kind.

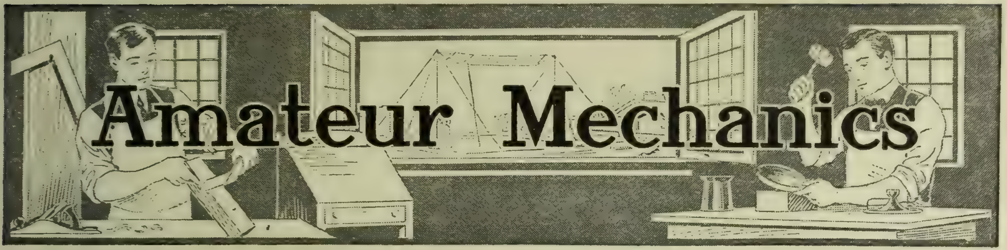
The only thing I could find on the market for holding a stub of a pencil was a combination wood and metal device, rather cumbersome for drawing, and intended only for short pieces of pencil. The holder shown in the accompanying illustration takes a whole pencil and this can be used up to the last bit, when a new one may be inserted.

The holder is made of a hollow tube having the ends split to receive the pencil and eraser, which are firmly clamped in the holder by the pressure from movable tightening bands.—Contributed by T. H. Lynn, Washington, D. C.



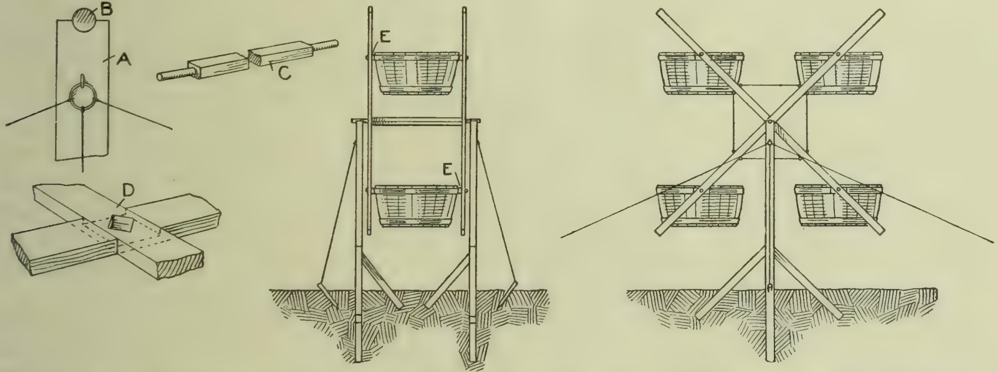
A Hollow Tube Receives the Whole Pencil, Which can be Used Up to the Last Bit

¶After cleaning furniture, the greasy appearance may be removed by adding some good, sharp vinegar to the furniture polish. Vinegar, which is nothing else than diluted acetic acid, is one of the best cleansers of dirty furniture.



A Playground Ferris Wheel

The whole wheel is carried on two uprights, each 3 by 4 in., by 10 ft. long. In the upper ends of these pieces, A, a half circle is cut out to receive the main shaft B. The end of the uprights are sunk 3 ft. into the earth and about 4 ft. apart, then braced as shown. They are further braced by wires attached to rings which are secured with staples near the top. The bearings should each have a cap to keep the shaft in place. These can be made of blocks of wood with a semicircle cut out, the blocks being nailed over the shaft, while it is in place, the nails entering the ends of the uprights.



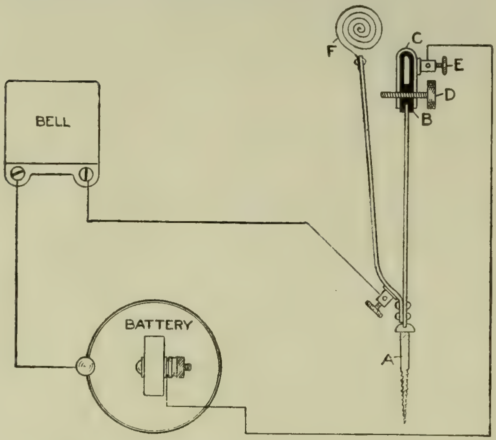
Detail of the Uprights, Axle and Spokes, and the End and Side Elevations of the Completed Wheel, Showing Braces and Cars Attached

The main shaft C is made of a 2½-in. square piece of good material, 4 ft. long. The ends are made round to serve as bearings, and the square part is fitted with the spokes or car carriers. These consist of 4 pieces, each 1 in. thick, 4 in. wide and 13 ft. long. In the center of each piece cut a notch one-half the thickness so that when each pair of pieces is crossed they will fit together with the surfaces smooth, as shown at D. A square hole is cut through the pieces as shown to fit on the square part of the main axle. While it is not shown in the illustration, it is best to strengthen this joint with another piece of wood, cut to fit on the axle and securely attached to the spokes.

The cars or carriers are made of two sugar barrels cut in half. The hoops are then securely nailed, both inside and outside; a block of wood, E, securely attached to the half barrel on the outside, and another block on the inside opposite the outside block. Holes are bored 2½ ft. from the ends of the spokes and a bolt run through them and through the blocks on the edges of the half barrels. The extending ends of the spokes are used to propel the wheel. Four children can ride in the wheel at one time.—Contributed by Maurice Baudier, New Orleans, La.

How to Make an Electric Fishing Signal

A unique electric fishing signal, which may be rigged up on a wharf or pier, and the electric circuit so arranged as to operate an electric bell or buzzer, located in the fisherman's cottage, or any other convenient place, may be constructed as follows: Obtain two pieces of $\frac{1}{16}$-in. spring brass, one 6 in. long and ¾ in. wide, and the other 7 in. long and ½ in. wide. Mount a 2-in. brass wood screw, A, in one end of the 6-in. piece as shown.



Construction of the Parts to Make the Contact Points and the Electric Connections

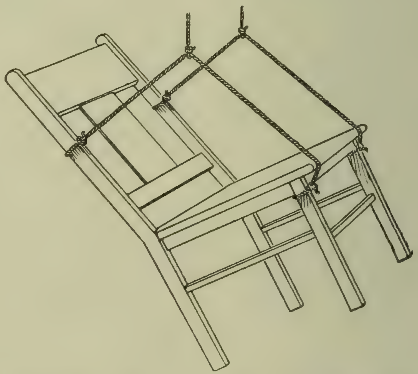
Place over the end of the 6-in. piece a thin sheet of insulating fiber, B, allowing it to extend down on each side about 1 in. Then bend a piece of $\frac{1}{16}$-in. brass, C, over the insulating fiber, allowing it to extend down on each side the same distance as the insulating fiber. Drill a small hole through the lower ends of the U-shaped piece of brass, C, the insulation, B, and the 6-in. piece, while they are all in place. Remove the insulation and the U-shaped brass piece, and tap the holes in the brass for a machine screw, D. Enlarge the hole in the 6-in piece, and provide an insulating bushing for it with an opening of the same diameter as the brass machine screw. Mount a small binding post, E, on one side of the U-shaped piece of brass, and the parts may then be put together and held in place by means of the brass screw.

Drill two holes in the other end of the 6-in. piece, also two holes in one end of the 7-in piece, and rivet them together with two small rivets. The 7-in. piece should project beyond the end of the 6-in. piece. A piece of thin spring brass should be made into the form of a spiral, F, and fastened to the upper end of the 7-in. piece. Provision should be made for attaching the fishline to the inside end of the brass spiral. A small binding post should be soldered to either the 6-in. or 7-in. piece, at the bottom.

If the device is set up with the head of the brass adjusting screw in the top of the 6-in. piece, pointing in the direction the line to the fishing hook is to run, and if a fish pulls upon the line, the 7-in. piece is pulled over and touches the point of the adjusting screw. If a battery and bell, or buzzer, is connected as shown, the circuit will be completed when the 7-in. piece comes in contact with the adjusting screw, and the bell will ring.

A Chair Swing

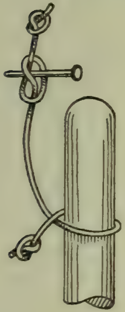
A comfortable porch or lawn swing can be easily and quickly made with a chair as a seat, as follows. Procure some rope of sufficient strength to bear the weight of the person, and fasten one end securely to one of the front legs of the chair and the other end to the same side of the back as shown



The Ropes are Tied to the Chair so That It will be Held in a Reclining Position in the illustration, allowing enough slack to form a right angle. Another piece of rope, of the same length, is then attached to the other side of the chair. The supporting ropes are tied to these ropes and to the joist or holding piece overhead.—Contributed by Wm. A. Robinson, Waynesboro, Pa.

Another Broom Holder

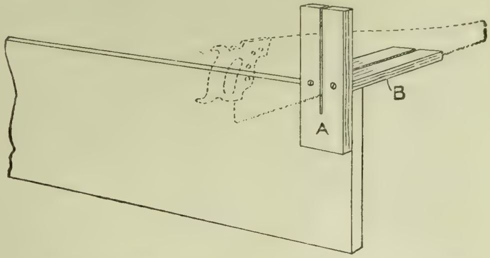
Of the many homemade devices for holding a broom this is one of the simplest, and one that any handy boy can make.



It consists of a string, about 1 ft. long, with a knot at one end and the other tied to a nail or staple driven into the wall. To hang up the broom simply turn the string around the handle as shown, and the broom will be held securely, because its weight will pull the string taut and the knot at the end will prevent the string from running off the handle.—Contributed by Jef De Vries, Antwerp, Belgium.

Squaring Wood Stock

The device shown in the sketch is a great help to the maker of mission furniture as a guide on short cuts. It consists of two pieces of wood, A and B, preferably of oak, fastened together at right angles by two large flat-head screws. The pieces should be placed exactly at right angles.



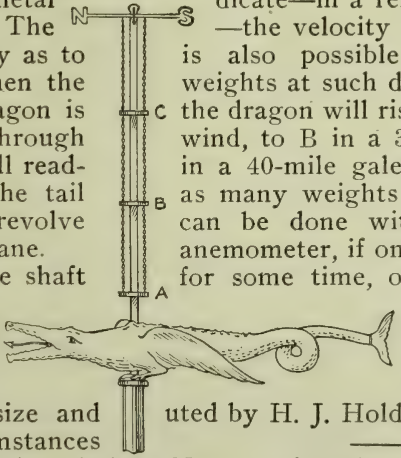
The Saw Teeth Edge can be Run through Both Pieces, the Stock being in the Corner

A cut is then made through both pieces. The cut on B should be exactly at right angles to the surface of piece A. This device can be either clamped on a board or merely held by hand, and will insure a true cut.—Contributed by F. W. Pumphrey, Owensboro, Ky.

A Wind Vane

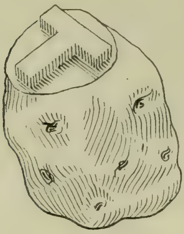
A novelty in wind vanes is shown in the accompanying sketch. The vane can be made of sheet metal or carved from light wood. The wings are so set on the body as to cause the dragon to rise when the wind strikes them. The dragon is pivoted on a shaft running through its center of gravity, so it will readily turn with the wind. The tail part may also be made to revolve as the propeller of an aeroplane.

The length and size of the shaft will depend on the dimensions of the dragon, and similarly, the location of the weights on the chains will be determined by its size and weight. Upon these circumstances and the varying velocities of the wind will depend how high the dragon will rise on its shaft, and the height reached by it will thus serve to indicate—in a relative manner only—the velocity of the wind, but it is also possible to arrange the weights at such distances apart that the dragon will rise to A in a 20-mile wind, to B in a 30-mile wind, to C in a 40-mile gale, and so on, with as many weights as desired. This can be done with the aid of an anemometer, if one can be borrowed for some time, or the device may be taken to the nearest weather bureau to be set.—Contributed by H. J. Holden, Ontario, Cal.



ℭNever rock a file—push it straight on filing work.

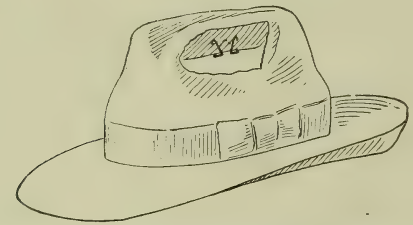
Homemade Letters for Marking Bags



An initial marker for bags can be made of a beet or potato. Cut off enough of the vegetable to provide a flat surface of sufficient size and then cut out the letter as shown in the sketch, and use shoe blacking as ink. In cutting, remember that most of the letters must be made reversed in order to print right. For example, in making a B, draw it out on paper and cut it out, then lay the face of the pattern on the flat surface of the vegetable and cut around it.

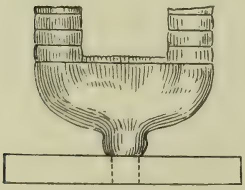
To Keep a Crease in a Soft Hat

The crease in a soft hat can be kept in proper shape with the aid of a paper clip. The clip is slipped over the fold inside of the hat which forms the bottom part of the crease.—Contributed by Jas. M. Kane, Doylestown, Pennsylvania.



Paper Clip on the Fold, Holding It in the Right Shape for the Outside Crease

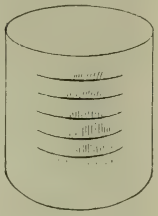
A Shoe Scraper



A good boot and shoe scraper for a step can be made of a worn-out and discarded broom. Cut off the straws and strings as shown in the sketch, allowing one string to hold them together, and make the notch the width of the shoe. Tie the extending ends together, and mount the whole on a suitable block, or, if desired, a hole can be bored in the step to receive the handle, and the scraper thus securely attached.

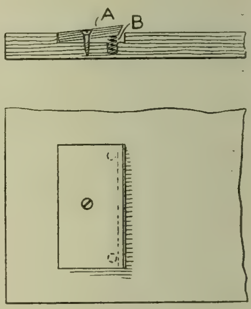
This makes an effective scraper for the bottom as well as the sides of shoes of almost any size.—Contributed by Jno. V. Loeffler, Evansville, Ind.

A Vegetable Slicer



A tin bucket or can makes a good slicer for vegetables when no other slicer is at hand. A number of slots are cut across one side of the can, and the lower edge of each slot slightly turned out to form a cutting edge. The vegetable is placed against the top of the can and pushed down over the slots. Each slot will cut off a slice which falls inside of the can.

Bench Stop for Planing Thin Boards



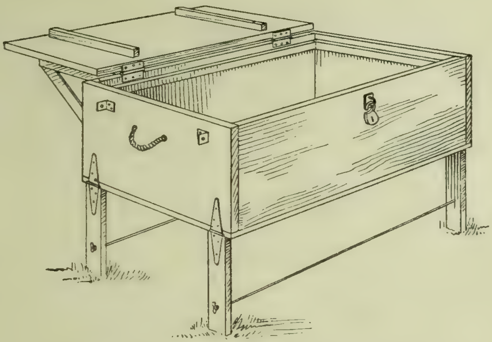
A bench stop for planing thin boards with a hand plane may be made in the following manner: Procure a piece of strap iron about ¼ in. thick, 1½ or 2 in. wide, and about 6 in. long. File or grind one edge sharp on top and drill a ¼-in. hole through the center. Cut a slot in a board or in the workbench large enough to receive the stop A flat. Place enough strips of rubber or fit two coil springs, B, to raise the sharp edge out of the slot. Insert a screw in the hole of the stop and adjust it to the desired height by turning the screw up or down.

¶In a case of emergency, lemon juice may be used as soldering flux.

A Camp Provision Box

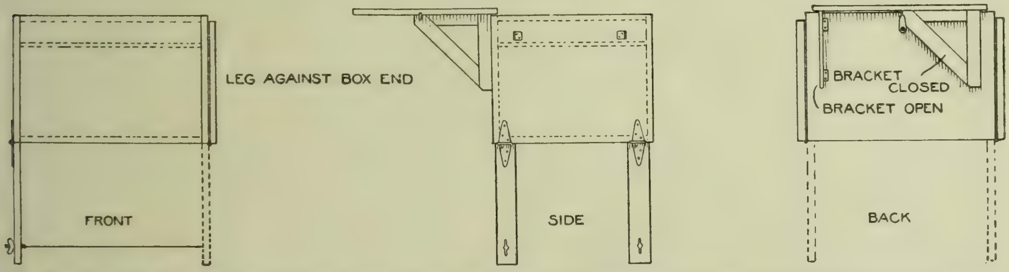
While on a camping and canoeing trip recently, I used a device which added a touch of completeness to our outfit and made camp life really enjoyable. This useful device is none other than a provision or "grub" box.

From experience campers know that the first important factor in having a successful trip is compactness of outfit. When undertaking an outing of this kind it is most desirable to have as few bundles to carry as possible, especially if one is going to be on the move part of the time. This device eliminates an unnecessary amount of bundles, thus making the trip easier for the campers, and doubly so if they intend canoeing part of the time; and, apart from its usefulness as a provision container, it affords a general repository for the small articles which mean so much to the camper's welfare.

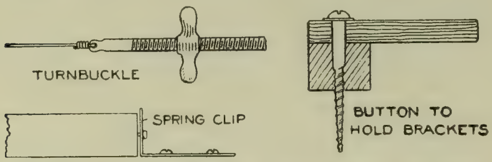

The Provision Box Ready for Use in Camp, the Cover Turned Back on the Brackets and the Legs Extended

The box proper may be made of any convenient size, so long as it is not too cumbersome for two people to handle. The dimensions given are for a box I used on a canoe trip of several hundred miles; and from experience I know it to be of a suitable size for canoeists. If the camper is going to have a fixed camp and have his luggage hauled, a larger box is much to be preferred. A glance at the figures will show the general proportions of the box. It may be possible, in some cases, to secure a strong packing box near the required dimensions, thus doing away with the trouble of constructing it. The distinguishing features of this box are the hinged cover, the folding legs, and the folding brackets. The brackets, upon which the top rests when open, fold in against the back of the box when not in use. The same may be said of the legs. They fold up alongside the box and are held there by spring-brass clips.

On our trips we carry an alcohol stove on which we do all of our cooking. The inner side of the top is covered with a sheet of asbestos, this side being uppermost when the hinged top is opened and resting on the folding brackets. The stove rested on this asbestos, thus making everything safe. The cover is large enough to do all the cooking on, and the box is so high that the cooking can be attended to without stooping over, which is much more pleasant than squatting before a camp fire getting the eyes full of smoke. The legs are hinged to the box in such a manner that all of the weight of the box



The Brackets for the Cover as Well as Each of the Four Legs Fold Against the Sides of the Box in Such a Manner as to be Out of the Way, Making the Box Easy to Carry and Store Away in a Small Space rests on the legs rather than on the hinges, and are kept from spreading apart by wire turnbuckles. These, being just bolts and wire, may be tucked inside the box when on the move. The top is fitted with unexposed hinges and with a lock to make it a safe place for storing valuables.



Detail of the Turnbuckle, Button to Hold the Brackets, and the Spring Clip for Holding the Legs on the Side of the Box

In constructing the cover it is well to make it so that it covers the joints of the sides, thus making the box waterproof from the top, if rain should fall on it. A partition can be made in one end to hold odds and ends. A tray could be installed, like the tray in a trunk, to hold knives, forks, spoons, etc., while the perishable supplies are kept underneath the tray. Give the box two coats of lead paint, and shellac the inside.

The wire braces for the legs are made as follows. Procure four machine bolts, about ¼ in. in diameter and 2 in. long—any thread will do—with wing nuts and washers to fit. Saw or file off the heads and drill a small hole in one end of each bolt, large enough to receive a No. 16 galvanized iron wire. Two inches from the bottom of each leg drill a hole to take the bolt loosely. Determine the exact distance between the outside edges of the legs when the box is resting on them. Make the wire braces 1 in. longer than this distance so that the bolts will protrude through the holes in the legs and allow for putting on the nuts and washers. Screwing up on the nuts draws the wire taut, thus holding the legs firm.

The size of the top determines the dimensions of the folding brackets which support it when open. These brackets may be solid blocks of wood, but a lighter and more serviceable bracket is constructed as follows. If the top is 20 in. wide and 30 in. long, make the brackets 10 by 13 in. Constructing the brackets so that their combined length is 4 in. shorter than the total length of the box, facilitates their folding against the back of the box when not in use. This point is clearly shown in the drawing. Our brackets were made of ½-in. oak, 1½ in. wide, and the joints halved together. They are hinged to the back of the box as shown; and when folded are held in place by a simple catch. The weight of the lid is sufficient to hold the brackets in place when open, but to make sure they will not creep when in use, insert a ¼-in. dowel in the end of each so that it protrudes ¼ in. Drill two holes in the top to the depth of ¼ in., so that when the top rests on the brackets, these holes engage with the dowels. In hinging the brackets to the back see that they are high enough to support the lid at right angles to the box.

The box here shown is made of ⅞ in. white pine throughout. The legs are ⅞ by 2½ by 18 in. They are fastened to the box with ordinary strap hinges. When folded up against the box they do not come quite to the top so that the box should be at least 19 in. high for 18-in. legs. About 2 in. from the bottom of the legs drive in a brad so it protrudes ⅛ in. as shown. This brad engages in a hole in the spring-brass clip when folded up as shown in the illustration.

If in a fixed camp, it is a good idea to stand the legs in tomato cans partly full of water. This prevents ants from crawling up the legs into the box, but it necessitates placing the wire braces higher on the legs.

Our box cost us nothing but the hardware, as we knocked some old packing boxes to pieces and planed up enough boards to make the sides. Of course, the builder need not adhere to these dimensions, for he can make the size to suit his requirements.—Contributed by C. A. Kotterman.

¶A blue writing ink is easily made of 1 oz. Prussian blue, 1½ oz. oxalic acid and 1 pt. of soft water. Shake and allow it to stand until dissolved.

How to Make a Copper Stencil for Marking Laundry

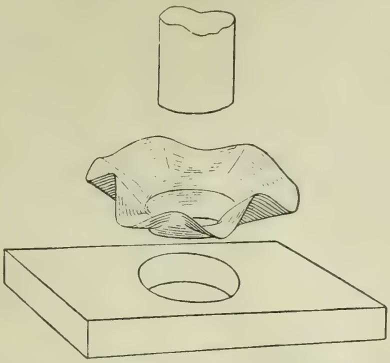
A stencil suitable for marking laundry may be easily made as follows: First procure a small sheet of "stencil sheet copper," about 1 in. wide and 4 in. long. Dip this sheet of copper in a vessel containing some melted beeswax, so that both sides will be evenly covered with a thin coat of the wax when it cools. The design—name, monogram or figure—that is wanted in the stencil should now be drawn upon a piece of thin white paper, the reverse side of the paper blackened with graphite, and then laid on the stencil plate with the design in the center of the plate, whereupon the design is lightly traced with a blunt point on the thin wax coating. After the paper is removed, trace the design on the wax surface with a pointed instrument, but not completely, the lines being broken at more or less regular intervals, to form "holders" so that, after etching, the design cannot fall out.

Next lay the stencil in a small shallow dish and pour a small quantity of fresh nitric acid over it. Keep the air bubbles removed from the surface by means of a piece of soft feather. The design will be eaten away in a very short time, where the wax has been removed, and this may be readily observed by holding the stencil plate up to the light. The acid should then be rinsed off with water, and the wax removed by heating and wiping it off with a cloth. The stencil may be given a final cleaning in a dish of benzine or gasoline, which will remove any remaining wax.

A Brass Pin Tray

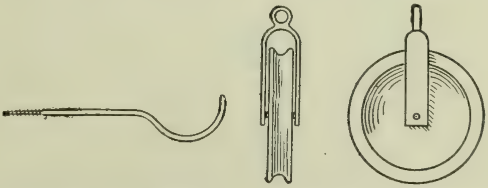
A novelty pin tray can be easily made of a piece of No. 24 gauge sheet brass or copper, 5 in. in diameter. The metal is annealed and polished with fine emery cloth, which is given a circular motion to produce a frosted effect. The necessary tools are a 1-in. hardwood board with a $2\frac{1}{2}$-in. hole bored in it, and a round piece of hard wood, $1\frac{7}{8}$ or 2 in. in diameter, with the ends sawn off square.

Place the sheet metal centrally over the hole in the board and set one end of the round stick in the center of the metal. Drive the stick with a hammer until a recess about 1 in. deep is made in the center. The edge of the metal will wrinkle up as shown in the sketch. It is scarcely possible to make two trays alike, as the edge almost invariably will buckle in a different manner.—Contributed by F. Van Eps, Plainfield, N. J.


The Former and Method of Using It to Produce a Wrinkled Edge on the Tray

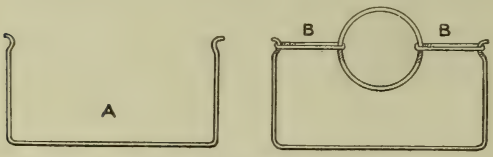
A Homemade Exerciser

A weight machine for exercising the muscles of the arms is easily constructed by using two screw hooks, 5 in. long, and two small pulleys, $2\frac{1}{2}$ in. in diameter. An awning pulley can be used for this purpose. The hole at the top of the hanger will allow the pulley to freely turn at almost any angle. A paving brick or a piece of metal can be used as a weight for each rope.—Contributed by Sterling R. Speirs, St. Louis, Mo.


The Yoke of the Pulley is so Arranged as to Make It Move in All Positions on the Hook

How to Make a Flutter Ring

The flutter ring is for inclosing in an envelope and to surprise the person opening it by the revolving of the ring. The main part is made of a piece of wire, A, bent so that the depth will be about 2 in. and the length 4 in. Procure or make a ring, 2 in. in diameter. The ring should be open like a key ring. Use two rubber bands, BB, in connecting the ring to the wire.

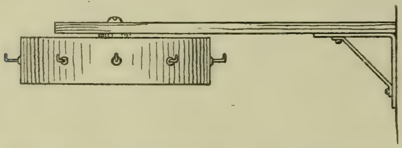


The Shape of the Wire and Manner of Attaching the Rubber Bands to the Ring

To use it, turn the ring over repeatedly, until the rubber bands are twisted tightly, then lay it flat in a paper folded like a letter. Hand it to someone in this shape or after first putting it into an envelope. When the paper is opened up, the ring will do the rest.—Contributed by D. Andrew McComb, Toledo, O.

A Kitchen Utensil Hanger

Every cook knows how troublesome it is to have several things hanging on one nail. When one of the articles is wanted it is usually at the back, and the others must be removed to secure it. A revolving rack for hanging a can opener, egg beater and cooking spoons, etc., takes up less space than several nails, and places every article within easy reach as well as providing individual hooks for all the pieces.

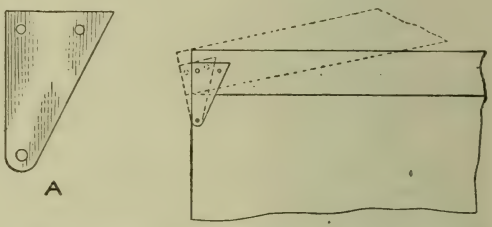


The Hook Support Revolves so as to Make Each One Readily Accessible for Hanging Utensils

The rack is easily made of a block of wood, 2½ in. in diameter and 1 in. thick; an arm, ¾ in. wide, ¼ in. thick and 6 in. long, and a metal bracket. The arm is fastened to the bracket and the bracket to the wall. A screw is turned through a loose-fitting hole bored in the end of the arm and into the disk. Screw hooks are placed around the edge of the dish as hangers.—Contributed by A. R. Moore, Toronto, Can.

Homemade Hinges for Boxes

A very simple form of hinge can be made as shown in the sketch. It is merely a matter of cutting out two pieces of flat steel, A, punching holes in them for screws or nails, and fastening them to the box corners, one on each side. When the box is open, the lid swings back clear and is out of the way. A hinge of this kind is very strong. For a light box, the parts can be cut from tin.—Contributed by Chas. Homewood, Waterloo, Iowa.



Hinge Parts Made of Sheet Metal and Their Use on a Box Cover

To Remove Odors from Ice Boxes

An easy way to prevent odors in an ice box is to place a can of coke in the box. This will take up all gases and prevent milk from tasting of onions or vegetables which may be kept in the box.

In factories where bad odors are apt to spoil the men's lunches put up in pails or baskets, a box can be constructed to hold these receptacles and a large pail of coke placed in it. Anything placed in this box will remain free from odors, and fresh.—Contributed by Loren Ward, Des Moines, Iowa.

How to Build a Wind Vane with an Electric Indicator

Quite often it is practically impossible to ascertain the direction of the wind by observing an ordinary wind vane on account of the necessity of locating the vane at such a height that it may give a true indication. By means of the device shown in Fig. 2, the position of the vane may be determined without actually looking at the vane itself and the indicating device may be located almost anywhere and independently of the position of the wind vane.

The principle upon which the device operates is that of the Wheatstone bridge. The position of the moving contact A, Fig. 1, is controlled by the wind vane. This contact is made to move over a specially constructed resistance R, Fig. 2. A second movable contact, B, is controlled by the observer and moves over a second resistance, identical with that over which the contact A moves. These two resistances are connected so as to form the two main branches of a Wheatstone bridge; the points A and B are connected to the current-detecting device, which may be a galvanometer or telephone receiver, and current is supplied by a number of dry cells.

In order to obtain a balance—that is, no current through the receiver—the points A and B must occupy corresponding positions on their respective resistances. If the two resistances over which the points A and B move are mounted in the same position with respect to the cardinal points of the compass, then the points themselves will always be in the same position with respect to the cardinal points when a balance is obtained. The arrow head on the wind vane and the point A are made to occupy corresponding positions, and hence the position of the point B, when no current passes through the receiver, is an indication of the direction in which the wind vane is pointing.

The principal parts in the construction of the device are shown in the illustration, and the following description of their construction may be of interest to those who contemplate building the indicator.

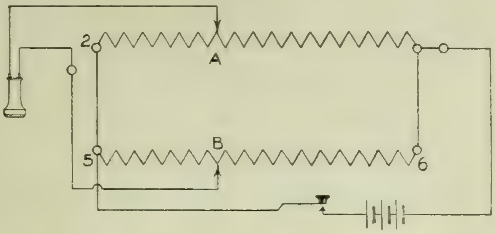


Fig. 1—The Diagram of a Wheatstone Bridge Which Shows the Points of Contact So Placed That a Balance is Obtained

Procure two pieces of $\frac{1}{16}$-in. hard rubber, 1½ in. wide by 24 in. long. Clamp these, side by side, between two boards and smooth down their edges and ends, and then file small slots in the edges with the edge of a three-cornered file. These slots should all be equally spaced about $\frac{3}{32}$ in. apart. Have the pieces clamped together while filing the slots and mark one edge top and one end right so that the pieces may be mounted alike. Now procure a small quantity of No. 20 gauge bare manganin wire. Fasten one end of this wire to one end of the pieces of rubber by winding it in and out through three or four small holes and then wind it around the piece, placing the various turns in the small slots that were filed in the edges. After completing the winding, fasten the end just as the starting end was attached. Wind the second piece of rubber in a similar manner and make sure to have the length of the free ends in each case the same. Obtain a cylinder of some kind, about 8 in. in diameter, warm the pieces of rubber by dipping them in hot water, bend them around the cylinder and allow them to cool.

A containing case, similar to that shown in cross section in the upper portion of Fig. 2 should now be constructed from a good quality of tin or copper. The inside diameter of this case should be about 1 in. more than the outside diameter of the resistance ring R, and it should be about 3 in. deep. The top C may be made curved as shown in the illustration, and should be fastened to the case proper by a number of small machine screws. The base of this case may be made so that the whole device can be mounted on the top of a pole.

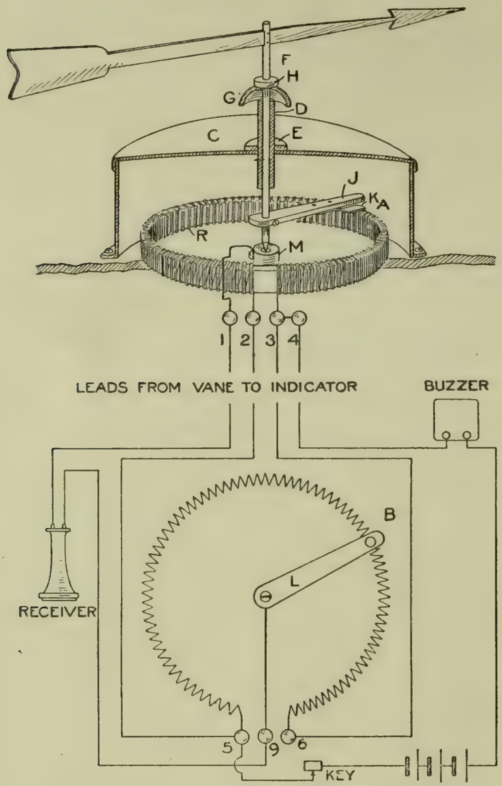


Fig. 2—The Weather Vane with Resistance Coil, and Diagram of Indicator Which is Identical with That of the Vane

Mount a piece of ¼-in. steel rod, about ½ in. long, with a conical hole in one end, in the center of the bottom of the case as shown by M. A number of supports, similar to the one shown, should be made from some ¼-in. hard rubber and fastened to the sides of the case, to support the resistance ring. The dimensions of these supports should be such that the ends of the piece of rubber, forming the ring, are against each other when it is in place. The upper edge of the ring should be about 2 in. above the bottom of the case.

Next, mount a piece of brass tube, D, in the exact center of the top and perpendicular to it. A washer, E, may also be soldered to the top so as to aid in holding the tube. Procure a piece of steel rod, F, that will fit in the tube D and turn freely. Sharpen one end of this rod and mount a brass wind vane on the other end. A small metal cup, G, may be soldered to a washer, H, and the whole mounted on the steel rod F in an inverted position as shown, which will prevent water from getting down inside the case along the rod. The cup G may be soldered directly to the rod. Make a small arm, J, of brass, and fasten a piece of light spring, K, to one side of it, near the outer end, then mount the arm on the steel rod so that it is parallel to the vane and its outer end points in the same direction as the arrow on the vane. The free end of the light spring on the arm J should be broad enough to bridge the gap between adjacent turns of wire on the resistance ring. Four bindings should then be mounted on the inside of the case and all insulated from it with the exception of number 1. Numbers 2 and 3 are connected to the ends of the winding and number 4 is connected to number 3.

A second outfit should now be constructed, identical with the one just described except that it should have a flat top with a circular scale mounted on it, and the arm L should be controlled by a small handle in the center of the scale. The position of the contact B may be indicated on the scale by a slender pointer, attached to the handle controlling the arm L.

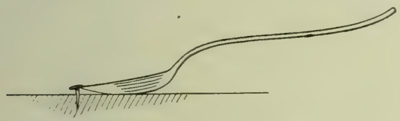
Four leads of equal resistance should be used in connecting the two devices and the connections made as shown. An ordinary buzzer placed in the battery circuit will produce an interrupted current through the bridge circuit and a balance will be obtained by adjusting the contact point B until a minimum hum is heard in the telephone receiver.

Cleaning Clothes by Boiling Them

When cleaning clothes by boiling them in a boiler over a fire, fit in a false bottom to keep the clothes from touching the bottom. The false bottom should be perforated with holes, ⅜-in. in diameter and 1 in. apart, over the entire piece. Fasten four legs, each about 2 in. long, to the under side to make a space between the bottoms. In washing, all that is necessary is to place the clothes in the boiler and boil them. The dirt will come loose and settle through the holes and on the boiler bottom.

An Emergency Tack Puller

One day I had to pull some tacks but had no tack puller at hand. An idea came to me to use the kitchen spoon, and I found that it worked even better than a regular tack puller. The ordinary kitchen spoon usually has an edge sharp enough to get under any tack.—Contributed by H. D. Harkins, St. Louis, Mo.


The Point of a Spoon will Easily Pull a Tack from Soft Wood

A Puzzle with Figures

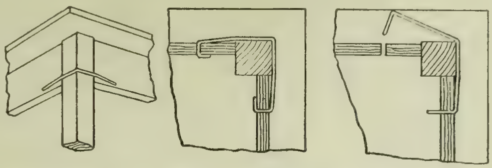
This puzzle is to arrange all the figures or digits, from 1 to 9 inclusively, in two rows, each containing all the digits, so that the sum in addition as well as the remainder in subtraction will have nine figures, in which all the digits are represented. There are several solutions to the puzzle, and the following is one of them:

371294568
216397845

The sum of the foregoing numbers and the remainder, when the lower row is subtracted from the upper, will both have nine figures and include all the digits from 1 to 9.—Contributed by Walter Bennett, Detroit, Mich.

To Fasten Loose Table Legs

When legs of an ordinary table become loose and unsteady they may be easily repaired as shown in the sketch.

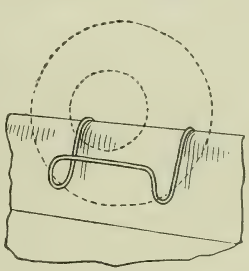

A Piece of Wire Bent around the Leg of a Table will Make It Rigid

Nails do not hold well in such places and glue will not stand much washing.

The method of making the repair is to drill ⅛-in. holes through the rails on each side of the leg and insert pieces of galvanized wire of a size to fit the holes. After the wire is inserted, the ends are bent over. The illustration clearly shows the repair.—Contributed by Edwin C. Wright, Newport, Ky.

Washbasin Holder

A piece of wire formed into the shape shown in the sketch makes a handy hook to hold a washbasin when it is not in use. This keeps it out of the way and out of the dirty water which might be thrown into the kitchen sink. — Contributed by F. C. Althen, Anamosa, Iowa.



A Cleaner for Canvas Shoes

One of the most economical cleansers for canvas shoes is oxide of zinc. Mix a small quantity of the powder with water, to the consistency of thin paste, and apply it to the canvas with an old toothbrush, rubbing it in thoroughly. Then set the shoes aside to dry before wearing them.—Contributed by Katharine D. Morse, Syracuse, N. Y.

¶A good substitute currycomb can be made of corncobs tied together tightly.

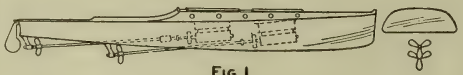


FIG. 1

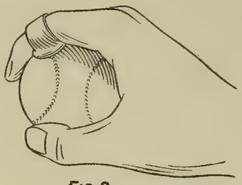


FIG. 2

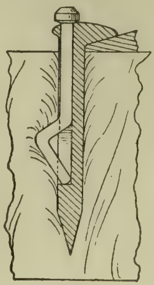


FIG. 3

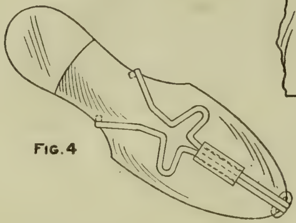


FIG. 4

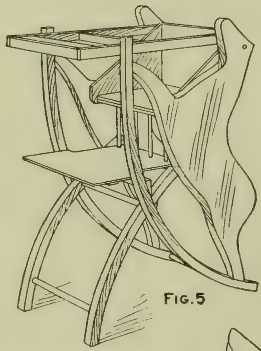


FIG. 5

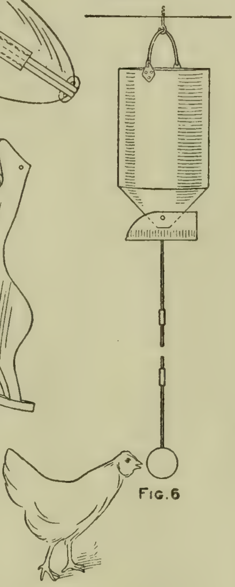


FIG. 6

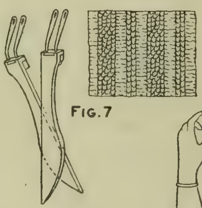


FIG. 7

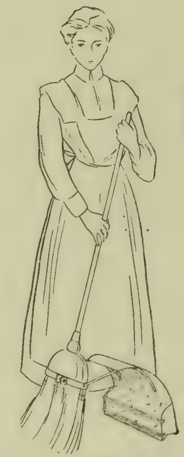


FIG. 8

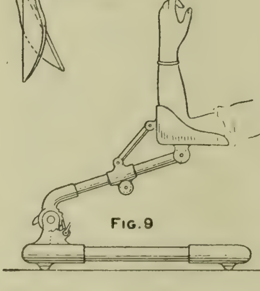


FIG. 9

INTERESTING PATENTS,

DOUBLE - PROPELLER ARRANGEMENT (British patent)—In Fig. 1 is shown an interesting arrangement of twin hydroplane propellers. The shafts are approximately parallel and in the same vertical plane, one propeller being several feet forward of the other. As shown in the drawing, each propeller is driven by an independent power unit, but a single unit geared to both shafts may be used. The claim is made that the arrangement is particularly applicable to mixed power units, such as the combination of a reciprocating engine and a turbine.

◆ ◆ ◆

BASEBALL CURVER—The little device shown in Fig. 2 is designed to help the budding baseball pitcher to curve the ball. It consists of a vacuum cup formed of rubber, designed to collapse to a greater or less extent under the pressure of the finger, according to the amount of curve desired. It is slipped over the forefinger of the pitching hand.

◆ ◆ ◆

SELF-LOCKING RAIL SPIKE—A rail spike that securely anchors itself in the tie when driven into place is shown in Fig. 3. The spike has a longitudinal groove, the end of which is square, and in this groove is a key provided with notches on opposite faces, so that when driven into the groove it will bend out laterally in V shape.

◆ ◆ ◆

EXTERNAL SHOE-TREE (British patent)—Figure 4 illustrates a shoe-tree designed for external application. It is made from spring-steel wire, bent to the shape shown, and provided with clips adapted to engage the top edge of the sole at the toe and instep. The tension of the arms of the device is adjusted by means of a tubular runner.

◆ ◆ ◆

COMBINED HOBBYHORSE AND HIGH CHAIR—Figure 5 shows an interesting combination of two articles required in a home where there are small children. During meal time it assumes the form of a high chair, and at other times provides the child with the delights of riding hobbyhorse.

◆ ◆ ◆

SIMPLE AUTOMATIC POULTRY FEEDER—An automatic feeder for poultry, simple in design, yet apparently as practical as similar devices of more complicated and expensive design, is illustrated by Fig. 6. The feeder, which is hung from any convenient support, comprises a grain container provided with a discharge opening at the bottom; a scoop pivoted underneath the opening, and a pendulum-like arrangement with a ball at its end. The chickens peck at this ball, thus causing the pendulum to swing, which tilts the scoop and allows a certain amount of grain to fall to the ground.

◆ ◆ ◆

HAND-OPERATED KNITTING DEVICE (British patent)—Machine-knit fabrics with twisted ribs, as shown in Fig. 7, may be produced by the use of the hand-knitting device, also shown in the drawing. This consists of two parts pivoted together, or united by pin-and-slot connections, each part being provided with covering points. The rib loops to be transposed are taken off the needles while the covering points remain in line, then the operation of the handles enables the loops to be conveniently replaced in the desired transposed position.

◆ ◆ ◆

DUST CATCHER FOR BROOMS—In Fig. 8 is illustrated a dust-catching attachment for brooms. The manner of attaching it is clearly shown. A shield is provided to obstruct the flight of the dust, which falls into the dust-absorbing material in the rack at the bottom.

◆ ◆ ◆

ARM-REST FOR GLOVE FITTING—An adjustable arm-rest, provided with a comfortable saddle upon which the elbow is rested while the glove is being fitted, is shown in Fig. 9. The base of the rest is provided with rollers, so that it may be swung into operative position on the counter.

PRACTICAL OR UNIQUE

SIMPLE SPRING-WINDING MACHINE—In Fig. 10 is shown a spring-winding machine which makes either compression or tension springs of any size from ½ in. to 12 ft. long, using any size wire from No. 26 to 3-16 in. The winder can be attached with a thumbscrew to any bench and is ready to wind any size of spring.

◆ ◆ ◆

COMBINED BOOK STRAP AND DRINKING CUP—In these days of the individual drinking cup, the combination shown in Fig. 11 may prove of practical use to students and lovers of books. The book strap has a flexible loop with a flanged cap secured to its center, adapted to receive and engage one end of a collapsible cup.

◆ ◆ ◆

JACK FOR TIGHTENING ANTI-SKID CHAINS—A practical device for the motorist's tool kit is shown in Fig. 12 in the form of a jack for tightening anti-skid tire chains. It comprises a main lever portion having a hook-shaped end, an arm, also provided with a hook at its free end and having a series of ratchet teeth arranged about its pivotal point, connected with the main lever portion, and a pawl on the main lever portion for engagement with the ratchet teeth.

◆ ◆ ◆

SPRING SWING—Figure 13 illustrates an interesting swing arrangement for children. Attached to the supporting frame are four levers pivotally mounted relative to each other, two levers extending in one direction and two in the other. The ropes supporting the swing-seat pass through the upper lever ends and are attached to the lower ones, and the weight of the person swinging tends to draw the levers together, thus giving a springy action and considerably extending the swinging period.

◆ ◆ ◆

NAIL-PULLING ATTACHMENT—An additional attachment for the ordinary type of nail-pulling hammer head, designed to aid in the extraction of long nails, is shown in Fig. 14. In pulling long nails with an ordinary hammer it is usually necessary, when the nail has been partially pulled, to place a block under the hammer head to provide a higher base for leverage, and it is to provide such a raised base without the necessity of finding a block that the attachment has been designed.

◆ ◆ ◆

MARCHING COMPASS (British patent)—In Fig. 15 is shown a device by means of which troops marching at night through open country can determine the direction of march and maintain it. The device, which is called a marching compass, comprises a graduated disk with a central sight-carrying arm and two other arms, which are so set in relation to one another that when the north star is sighted over the central sight and one of the peripheral sights, the line between the former and the remaining sight gives the direction of march. A mirror may be used instead of one of the sighting arms.

◆ ◆ ◆

RESERVOIR ATTACHMENT FOR PENS—An ink fountain, designed to convert the ordinary pen into a semi-fountain pen, is shown in Fig. 16. The attachment comprises a cup attached to the nib of the pen as illustrated. The pen is dipped in an inkwell or bottle in the usual way and held there long enough for the cup to fill, after which the writing may be continued for a considerable period before another dip into the ink is required.

◆ ◆ ◆

PRESSURE-OPERATED EGG-BEATER—Figure 17 shows an implement for beating eggs, whipping cream, and mixing ingredients, which is operated in a similar manner to the spiral-ratchet screwdriver or drill-head. The pushing down of the handle causes the vanes to revolve rapidly.

◆ ◆ ◆

BRIDGELESS EYEGLASSES—In the eyeglasses shown in Fig. 18 the bridge is entirely done away with, the lens being held in position by a metal spring band passing completely around the head. When only one side of the face is viewed the glass has an appearance very similar to that of a monocle.

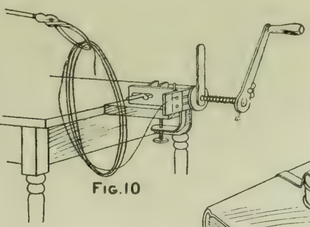


Fig. 10

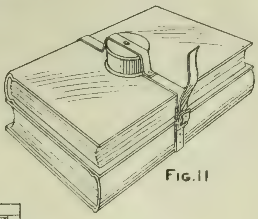


Fig. 11

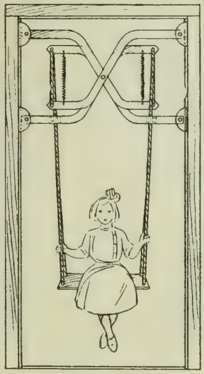


Fig. 13

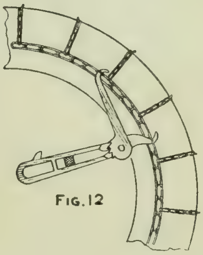


Fig. 12

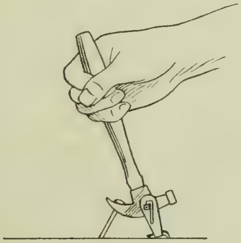


Fig. 14

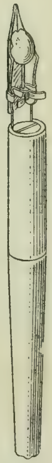


Fig. 16

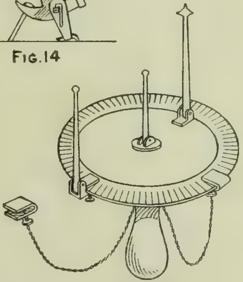


Fig. 15

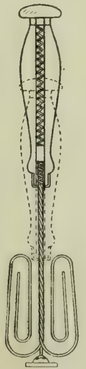


Fig. 17

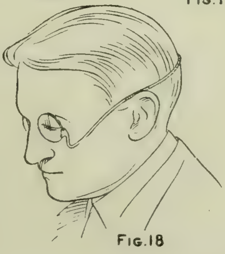


Fig. 18

At a concert for charity in a country town, Miss Carter obliged by reciting "The Village Blacksmith." At the conclusion of her recital the rural audience cheered.

"Ancower!" they cried. "Ancower!"

Miss Carter was about to grant the request when a burly fellow very much out of breath tapped her on the shoulder.

"I've just come round from in front," whispered the man excitedly. "I want yer to do me a favor."

"Well, what is it?" queried Miss Carter.

"It's this," whispered the intruder. "I happen ter be the feller you've been talkin' about, and I want yer to put in a verse this time sayin' as how I let out bicycles."

◆ ◆ ◆

First Farmhand—Now, what do you suppose that old hen is eating them tacks for?

Second Farmhand—Perhaps she's goin' to lay a carpet!

◆ ◆ ◆

A certain company promoter once built a castle on a mountain peak. As he showed the gray Medieval looking pile to a friend, he said:

"I don't know what to call it. What name do you advise?"

"It looks like those Scotch castles in the Highlands," said the friend. "Why not call it Dunrobin?"

"Dunrobin? Dunrobin? Yes, that would be a good name," said the millionaire; "only, you see, I have no intention of retiring yet."

◆ ◆ ◆

Teacher—Archibald, what plants flourish in excessive heat?

Archibald—Ice plants.—Judge.

◆ ◆ ◆

A certain millionaire bought a Raphael in Rome. The Italian law prohibits the exportation of masterpieces, and the buyer had the happy idea of getting the Raphael painted over. This was accordingly done. The rare old painting reached London in the guise of a modern snow scene.

Then a restorer, under the watchful owner's eye, set to work on it. With a sponge dipped in turpentine he proceeded to sponge the snow scene off. He sponged it off readily, but he sponged a bit of the Raphael off too,—and, behold, underneath the Raphael a portrait of Marconi was revealed—London Opinion.

◆ ◆ ◆

True Economy—Friend—Why do you wear those fearfully old-fashioned collars? Winkers (a man of affairs)—Because, when the washerwoman sends them to anybody else they send them back.—Foster, in New York Weekly.

◆ ◆ ◆

An aviator descended in a field and said to a rather well-dressed individual: "Here, mind my machine a minute, will you?"

"What?" the well-dressed individual snarled. "Me mind your machine? Why, I'm a United States Senator!"

"Well, what of it?" said the aviator. "I'll trust you."—Argonaut.

◆ ◆ ◆

The Boss Barber—What? You have cut the gentleman four times? Well, just for punishment, you must shave him all over again, right away!—Fliegende Blaetter.

◆ ◆ ◆

A well-known Scottish architect was traveling in Palestine recently, when news reached him of an addition to his family circle. The happy father immediately provided himself with some water from the Jordan to carry home for the christening of the infant, and returned to Scotland.

On the Sunday appointed for the ceremony he duly presented himself at the church, and sought out the beadle in order to hand over the precious water to his care. He pulled the flask from his pocket, but the beadle held up a warning hand, and came nearer to whisper:

"No the noo, sir; no the noo! Maybe after the kirk's oot!"

"That Jones boy who used to work for you wants to hire out to me. Is he steady?"

"Steady? If he was any steadier he'd be motionless."—Judge.

◆ ◆ ◆

It was a divorce case, and the detective witness came to the stand dressed in black broadcloth, wore a gold fob and seals, and looked much more like a respectable middle-aged solicitor than a member of the police force. The man's testimony was damaging to his client, so the learned counsel began his cross-examination very gently and was excessively polite.

"I believe you are John Blank, of the firm of Blank & Co., the eminent detectives?"

"Yes, sir," said the witness, "I represent that firm."

"And I presume," continued the counsel, "that in the course of your duties as a detective you have, at times, to assume many disguises?"

"Yes, sir."

"Then," said the counsel, smiling, "will you have the goodness to tell the court just what you are disguised as now."

◆ ◆ ◆

"Queer name," remarked the editor.

"Yes, it might belong to either a parlor car or a Russian dancer."—Satire.

◆ ◆ ◆

Herbert stood on a chair. The chair stood in the pantry. The jam stood on the shelf. Herbert's mother stood on the threshold. Herbert stood his ground. "My son," said the mother, pointing at him with astonishment, "I am s-u-r-prised! To think that my little boy would do a thing like that." Herbert, resourceful and not at all abashed, looked his mother straight in the eye. "Please do not interfere with the minnuvers of a boy scout," he said. "A boy scout?" "Yes, mother, after supplies."

◆ ◆ ◆

Knicker—What is Jones trying to invent?

Bocker—A banana peel that won't skid.—Judge.

◆ ◆ ◆

"What you need, madam, is oxygen. Come every afternoon for your inhalations. They will cost you $4 each."

"I knew that other doctor didn't understand my case," declared the fashionable patient. "He told me all I needed was plain fresh air."—Washington Herald.

◆ ◆ ◆

"What's that big iron thing?" asked Laura.

"Locomotive boiler," replied Tom.

After a moment's silence, Laura inquired, "Why do they boil locomotives?"

"To make 'em tender!" said Tom.—Santa Fe Employee's Magazine.

◆ ◆ ◆

"What be these?"

"Talking machines, you rube. Drop a nickel in the slot and the machine will talk to you."

"By heck, I'd do it, if I thought I could git a civil answer."—Washington Herald.

◆ ◆ ◆

"What's the matter with that friend of yours? He acts like a crazy man."

"He's all right, only you see he's from Central America and every time he hears a motorcycle he thinks a revolution has been started."—Chicago Record-Herald.

◆ ◆ ◆

Lady (to tramp who had been commissioned to find her lost poodle)—The poor little darling, where did you find him?

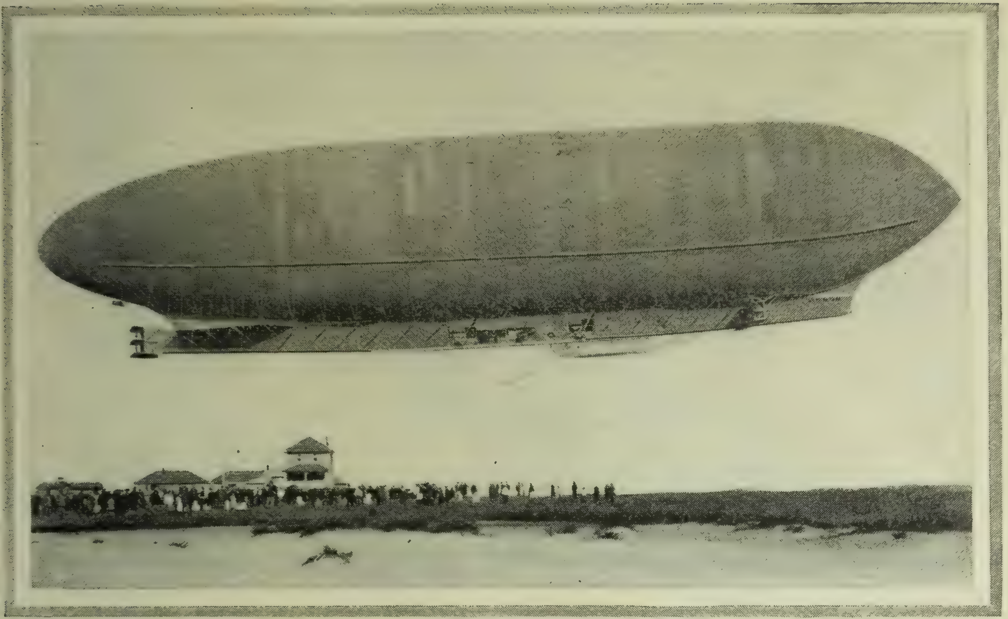
Tramp—Oh, a man 'ad 'im, miss, tied to a pole, and was cleaning the windows wiv 'im!

◆ ◆ ◆

Boy—I want another box of pills like I got for mother yesterday.

Druggist—Did your mother say they were good?

Boy—No; but they just fit my air-gun.



The "Akron" Anchored over the Shore at Atlantic City on the Day of Her First Flight. The Lifeboat is Shown in Position under the Car

THE END OF THE AMERICAN ATTEMPT TO CROSS THE ATLANTIC BY AIRSHIP

The bursting of the trans-Atlantic airship "Akron" while flying 1,000 ft. above the ocean at Atlantic City, early on the morning of July 2, killing Melvin Vaniman and his crew of four men, shocked the American public more than any other aerial accident in the past year or two. It came shortly after a number of fatal aeroplane accidents, Miss Harriet Quimby, the first American woman to receive an air-pilot's license, and her passenger, W. A. P. Willard, falling to their death the previous day at Boston.

The disaster to the "Akron" was the ending of the trans-Atlantic aerial voyage first planned by Walter Wellman, after his final unsuccessful attempt to fly to the North Pole in 1909. Melvin Vaniman was Wellman's chief of staff in the North Pole attempt, and also in the unsuccessful attempt to cross the Atlantic in the "America" in 1910. In this, the first of the trans-Atlantic attempts, the airship was in the air 71½ hours and traveled approximately 1,000 miles, the crew abandoning it at a point about 375 miles out from the Atlantic coast, directly east of Cape Hatteras.

Both Vaniman and Wellman retained their enthusiasm and said they would try again, building another airship in the construction of which they would profit by experience. Later, however, Wellman withdrew and Melvin Vaniman went on with the project alone.

When the "Akron" started on its fatal flight, July 2, the atmospheric conditions seemed exceptionally favorable. Vaniman appeared to have complete control, and, after circling about over the inlet and the mainland, pointed the ship's nose out to sea. To those who had witnessed the many flights of Vaniman this one promised at the start to be more successful than any before attempted.

When at an altitude of about 1,000 ft., a sudden puff of smoke was seen at one end of the gas bag. In a minute the bag exploded, a mass of flames hid the ship from view, then the car broke away from the envelope, and plunged downward. In the descent something which appeared to be the body of a man shot out to the left of the wreckage and struck the water before the rest of the descending mass.

One theory of the cause of the explosion is that somebody let too much free gas into the engines and backed up the exhaust. This is the idea of Chief Beck of the fire department, who was on hand with his men to help in the launching. He had no idea that anything was wrong until he saw the smoke suddenly change to flame and the entire rear of the bag go up as though by explosion.

Another theory is that a dangling rope of the rigging dragged into the big propellers, whipped up against the stern end of the envelope and snapped off enough of the cone to free the gas, allowing the vapor to sweep into the engines and explode, while other reports ascribe the bursting of the envelope to expansion of the inclosed gas from the heat of the sun.

The "Akron" was 258 ft. long, with an extreme diameter of 45 ft. The framework, with the four engines, cylindrical gasoline tank and cabin, weighed about 14,000 lb. The fuel tank had a capacity of about 8,000 lb. of gasoline. The lifting power was estimated to be about 26,000 lb., and the engines developed 277 hp. A 100-hp. engine was used for the forward vertical propellers, and two 80-hp. engines for the two sets of orientable propellers, which could be turned from the horizontal to the vertical, to help raise and lower the ship. The remainder of the power plant consisted of a 17-hp. engine and a small dynamo.

HEAT AND WATERPROOF FIREMEN'S SUITS

Special suiting for firemen, claimed to be both water and heat-proof, but otherwise like the ordinary fireman's suit, is manufactured by a sporting-goods concern in Indiana. The suiting is composed of two pieces of cloth cemented together with rubber between. In this way the rubber is kept from exposure to the heat and air, which would act upon it injuriously.

Constructing the Envelope of the Ill-Fated Airship in the Factory at Akron, Ohio. It was the Largest Ever Made in the United States

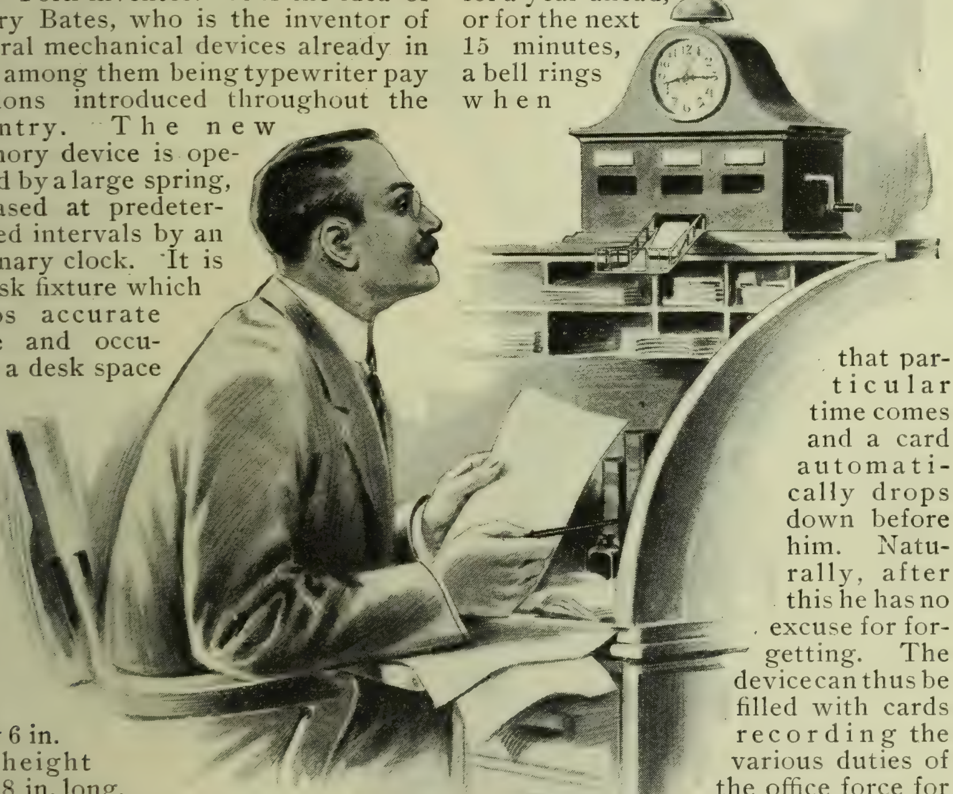
Popular Mechanics Magazine

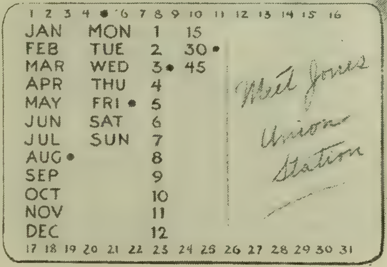
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 18 SEPTEMBER, 1912 No. 3

Memory Machine That Stays on the Job

THE first mechanical apparatus intended to prevent the busy man from forgetting any of his engagements has just been devised by a New York inventor. It is the idea of Harry Bates, who is the inventor of several mechanical devices already in use, among them being typewriter pay stations introduced throughout the country. The new memory device is operated by a large spring, released at predetermined intervals by an ordinary clock. It is a desk fixture which keeps accurate time and occupies a desk space only 6 in. in height and 8 in. long. It has the appearance of a desk clock with three sets of pigeon holes, one series for the months of the year, another for the days of the month, and the third for each quarter of an hour of the day.





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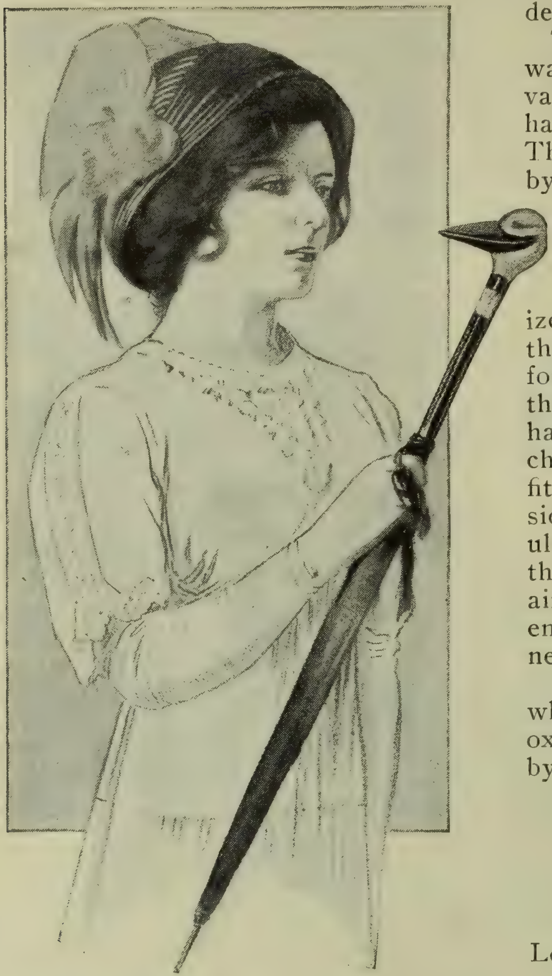
Meet Jones
Union
Station

A busy professional, or business man wishing to be reminded of something he is to do in the future, makes a memorandum of it on a card and drops it into the case in the pigeon hole set aside for that purpose. No matter whether the engagement is for a year ahead, or for the next 15 minutes, a bell rings when that particular time comes and a card automatically drops down before him. Naturally, after this he has no excuse for forgetting. The device can thus be filled with cards recording the various duties of the office force for the next day, and in the absence of the head of the office each clerk will be reminded at the proper time of just what he has to do. No alarm ever comes from the case unless there is a memorandum in it, and it can be operated by one girl in the office to keep all the engagements of every one in the office.

GROTESQUE BIRD'S-HEAD UMBRELLA HANDLES

The Parisian always enjoys the grotesque, which finds its way into many fashions and novelties. This time it is an umbrella grotesque, and all feminine Paris has the rage. The umbrella heads represent different birds smiling a stupid smile which is guaranteed to make one laugh, even though depressed. The bird heads are designed by various well-known French caricaturists and bear their autographs, which makes them interesting objects for examination and comparison.



Bird's-Head Umbrella-Handle Designs Amuse Paris

BREATHING OZONIZED AIR INCREASES WEIGHT

Recent tests made upon men employed in the First National Bank of Chicago have shown that ozonizing the air increases the weight of clerks who breathe the mixture, by promoting deep and exhaustive breathing.

The men upon whom the experiment was tried were at work in the bank's vault, a place the ventilation of which has always been a difficult problem. The ozone was produced in the room by means of several electrical machines placed in the corners.

The weight and chest measurement of each man employed in the vault were taken when the ozonizers were installed, and again after the machines had been in operation for two months. It was found that in this short space of time, every man had gained in weight as well as in chest measurement. And the benefit was not confined to the physical side of the man; the mental faculties as well were quickened by the inhalation of the pure fresh air. The men themselves were enthusiastic about the success of the new system.

The process is familiar. The ozone, which is simply a special form of free oxygen, is produced in the atmosphere by the silent discharge of electricity.

ELECTRICAL ACCIDENTS SHOW NO INCREASE

Reports of factory inspectors in London have brought out some remarkable figures on the increased use of electricity as power. During the last 10 years, the report shows, the use of electric power from the public plants alone has increased from 30,000 hp. to 74,000 hp. This in itself is not so astonishing as the fact that since 1907 the total number of accidents annually has not increased at all. In the opinion of the inspectors such accidents as did occur were not so much due to the ignorance, or incompetence, of employes handling electrical machinery [illegible] the carelessness of employers in [illegible] provide proper safeguards [illegible]se. As an example, it is pointed out that the sparking of electrical apparatus in a dusty oil-cake mill was responsible for an explosion and consequent loss of life, but might have been avoided if precautions had been taken to prevent the sparking.

ELECTRIC MILKING IN THE PASTURE

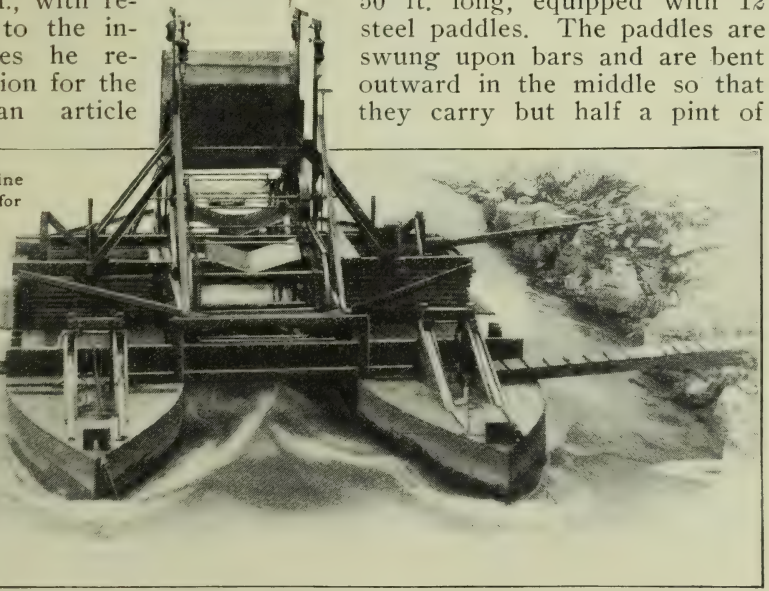
Milking the cows in the pastures by means of electrical milking machines is being successfully tried on the great farm near Berlin which is operated by that city. Cables carrying power are laid out to the pastures and the motor and milking apparatus all in one machine is easily carried around. It has been found that one man can take care of the operation of six milking machines out in the fields. Electricity is used in every possible way on the farm, and for this purpose a network of transmission wires covers the farm, so that short flexible cables for motors will bring power to any desired spot from the feed wires.

Milking a Cow in the Pasture with an Electrically Driven Milking Machine, on the Berlin Municipal Farm

MOTOR GETS POWER FROM STREAM FLOW

A hydroelectric power machine, which the inventor claims will be an important factor in the manufacture of electricity by water power, has just been tested in the Chicago Drainage Canal at Joliet, Ill., with results satisfactory to the inventor. He states he received the suggestion for the machine from an article which appeared in Popular Mechanics Magazine a year ago.

The machine consists of two cogwheels, one 20 ft. and the other 12 ft. in diameter, over which run two chains 50 ft. long, equipped with 12 steel paddles. The paddles are swung upon bars and are bent outward in the middle so that they carry but half a pint of


Hydroelectric Machine Developing Power for Lights, from Stream Current in Chicago Drainage Canal

water after leaving the stream. A frame fits over the wheels and chain, and above it is placed an electric motor connected, by means of a chain, with a flywheel, which in turn is connected with the smaller of the two water wheels. The entire frame rests upon two barges and is lowered into the water so that the smaller wheel, which faces the stream, is almost submerged. At the initial try-out the machine showed 48 per cent efficiency in an eight-mile current, according to the inventor.

The motor was connected with a dynamo and electric current generated. Ten arc lights, a number of incandescent lamps and two searchlights were wired up to the generator and light was furnished for an evening band concert in the city park of Joliet.

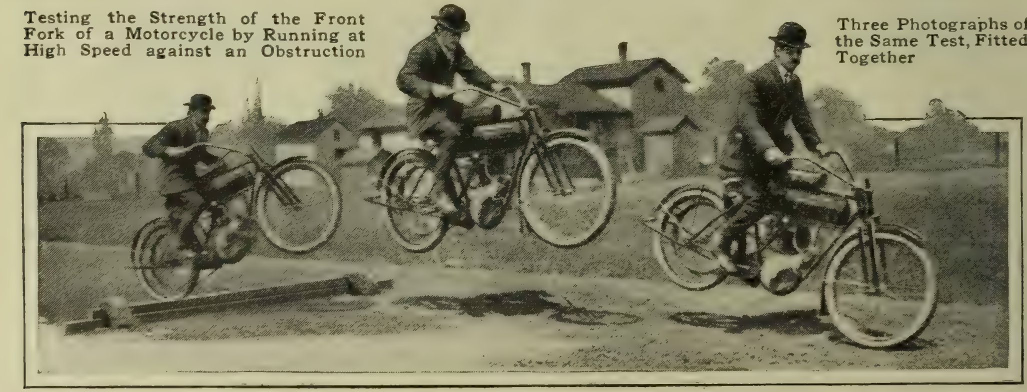
"HURDLING" WITH A MOTORCYCLE

The very interesting illustration accompanying this article shows the so-called hurdle test for spring forks, which is carried out at the factory of one of the well-known motorcycle concerns in this country. The test consists in driving the cycle around an oval test track at a speed of about 40 miles an hour, across which a 4 by 4-in. timber obstruction has been laid. On striking this, the machine with its rider jumps about 2 ft. into the air and alights some 10 ft. away, thus subjecting the forks to a greater shock than they are ordinarily liable to suffer in regular service.

MAKING OVEREXPOSURE IMPOSSIBLE

Photographic plates in the use of which overexposure is impossible, have recently been put on the market by an English manufacturer. The improvement is due to the addition of certain chemicals (hydrazine and hydroxylamine derivatives) to the sensitive film. The speed of the plate is not adversely affected by the new method. In landscape photographs it is possible to include the sun itself without danger of "fogging." If, however, the exposure has been more than 40 times the normal, a special developer is required, the formula for which has been provided by the manufacturer. In all cases of shorter exposure the ordinary developer is found satisfactory. With the new plate it is possible to photograph a room with a brightly lighted window, notwithstanding its acute contrast with the interior. In instances of this character, of course, it is necessary to prolong exposure in order to obtain detail in dimly lighted portions of the picture.

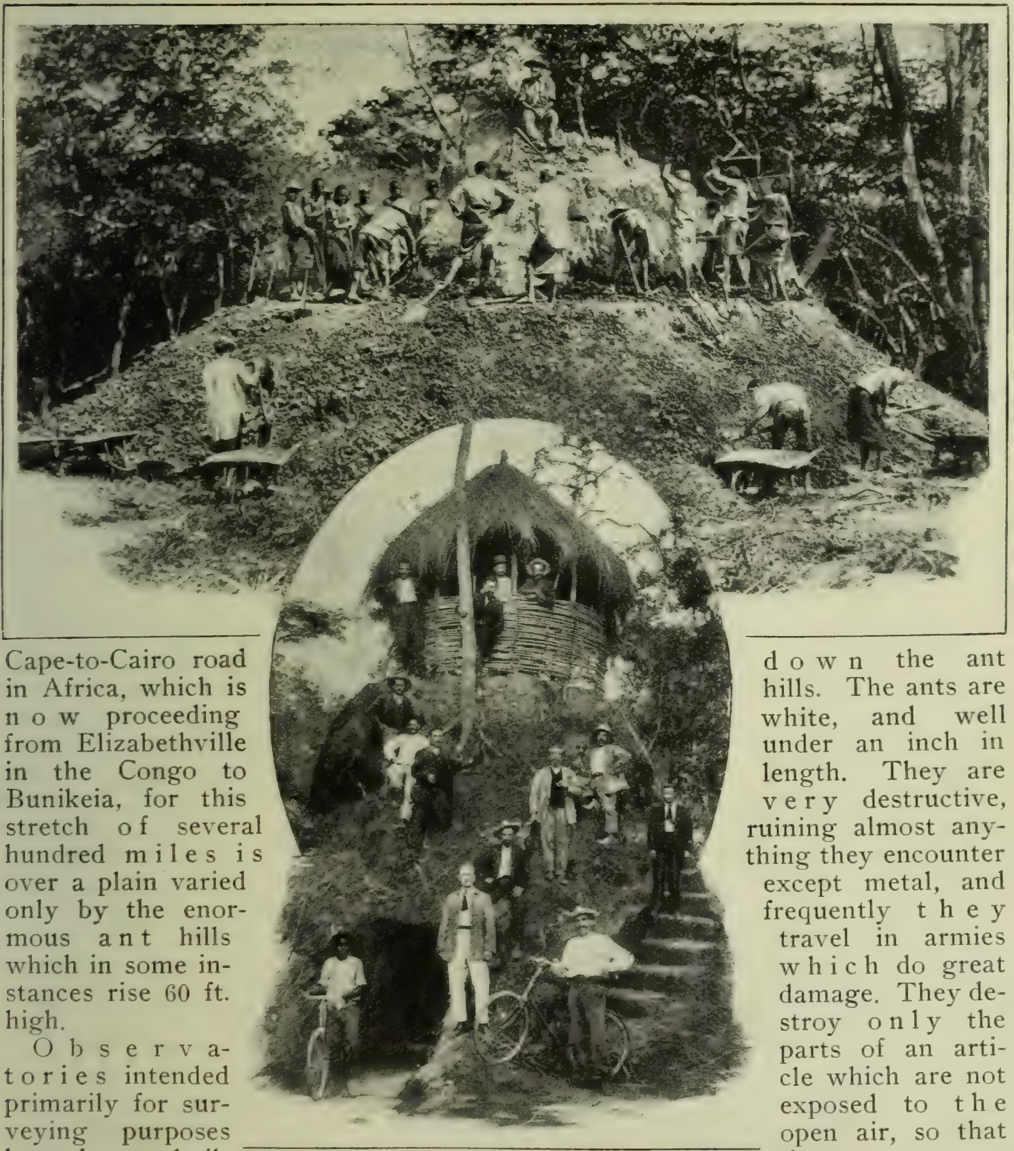
Another development in photography is the production, also by an English manufacturer, of a print paper which is termed cream-canvas bromide and gaslight paper. As indicated by the name the paper is of cream color over which is spread the canvas grain which gives the finished print the appearance of a one-color painting. The tone of the paper is suited to effects obtained by sunlight, and for figure studies in strongly lighted studios.


Testing the Strength of the Front Fork of a Motorcycle by Running at High Speed against an Obstruction

Three Photographs of the Same Test, Fitted Together

GRADING A RAILROAD THROUGH ANT HILLS

Ant hills are furnishing a considerable portion of the work for contractors on the present extension of the Cape-to-Cairo road in Africa, which is now proceeding from Elizabethville in the Congo to Bunikeia, for this stretch of several hundred miles is over a plain varied only by the enormous ant hills which in some instances rise 60 ft. high.



Upper View—Laborers Tearing Down a Great Ant Hill on Level Plain in Congo to Make Way for Cape-to-Cairo Railway Roadbed

Lower View—Monster Ant Hill on the Cape-to-Cairo Railroad near Elizabethville, Congo, Which is being Used by Surveyors as an Observatory

Observatories intended primarily for surveying purposes have been built by the contractors on these ant hills. The preparation of the roadbed through this section requires only the cleaning out of the jungle along the right of way, and the destruction of the ant hills which are encountered, but as all the earthwork is done by hand labor, much time is spent tearing down the ant hills. The ants are white, and well under an inch in length. They are very destructive, ruining almost anything they encounter except metal, and frequently they travel in armies which do great damage. They destroy only the parts of an article which are not exposed to the open air, so that the surveyors have found that when they left shoes where the ants could reach them, the soles were entirely eaten away by the insects while the uppers were left.

VAST SECTION COVERED WITH ASHES FROM

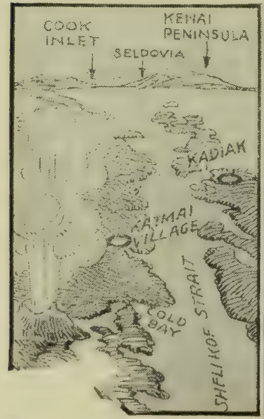
A mighty volcanic eruption which covered a vast section with volcanic ashes, all on United States territory, this summer, passed almost unnoticed due to the fact that it occurred in the sparsely settled southwestern Alaska. News comes out of that region so slowly and so incomplete that facts of the extent of the eruption, its damage, and photographs of its progress are difficult to obtain. Yet its magnitude is indicated by the fact that the clouds of volcanic ashes were observed as far away as Prince Rupert, British Columbia, a thousand miles from the scene of the disturbance in the Aleutian Range.

Mt. Katmai and Mt. Peulik of this range were both charged with the eruption, Peulik being the first considered as there is little knowledge about the mysterious Katmai, far in the mountain wilderness, but the later evidence all points to Katmai being the disturber, located not far from the seashore settlement of Katmai, a short distance north of Mt. Peulik and Cold Bay. Reports based on unsatisfactory and distant views of Mt. Katmai are to the effect that the mountain now has three craters.

On June 6 the mighty cannonading of Katmai "blowing off its head" was heard over a great section of southwestern Alaska, and by night the rain of volcanic ashes came. The nearest village of any size is Kadiak, on Kadiak island, which has a population of about 500, most of the people living on the fish-canning industry. For three days following the outbreak of Katmai, gray volcanic ashes filled the air so that one could not see more than five feet. The entire population was taken on board the revenue cutter "Manning" and taken out to sea to escape suffocation.

The ashes covered Kadiak to a depth of from one to four feet, and appeared to be in three layers, powdered pumice stone at the bottom, yellow sulphuric ash, and then the gray volcanic ash on

Lower View Shows Volcanic Ashes One to Four Feet in Depth over Kadiak Village



ERUPTION OF ALASKAN VOLCANO KATMAI

Katmai in Eruption

Reindeer Seeking Shelter

Near View of Katmai

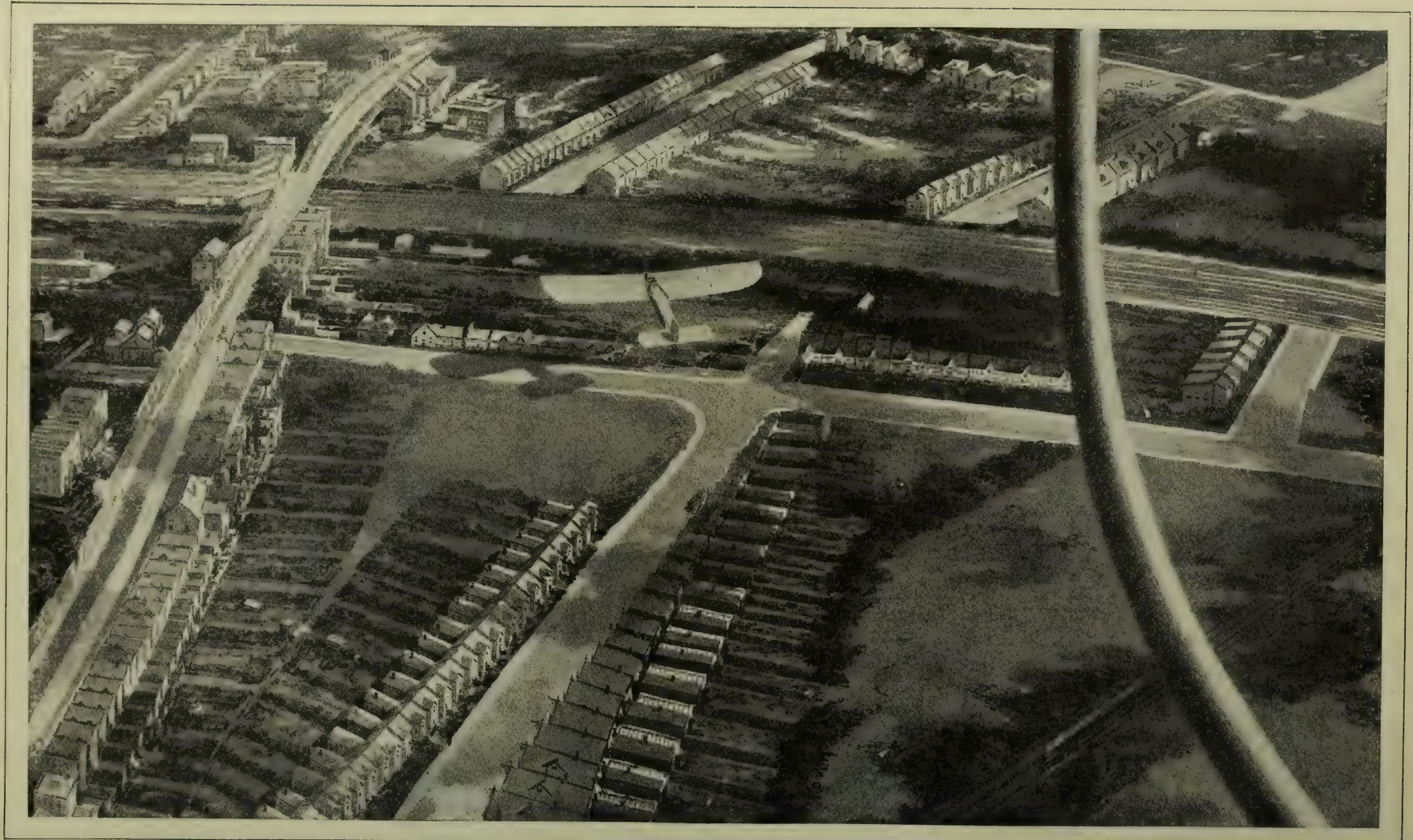
top, constituting the larger portion of the coat. The roof of one of the canneries gave way under the weight. As far away as Cook Inlet, 400 miles to the northeast, the ashes in some places accumulated to a depth of a foot.

Inhabitants of Katmai village fled by boat, at the beginning of the eruption to the island of Afognak across Shelikof Strait, and from the settlements of Cold Bay, Kanatuck, Douglas, Kanganute and Savanoosky the frightened fishermen and ranchers hurried in boats to Kadiak and out on the open straits. A mother and her child are known to have lost their lives in Katmai village.

Photographs of the distant mountain in eruption were obtained from the deck of the steamer "Dora," between Kadiak and Afognak islands, on June 6, until, by 4:30 in the afternoon, daylight was blotted out and electric lights had to be used, in a season when daylight is almost continuous.

After the heavy rain of ashes came rainstorms, which were in the end providential to the inhabitants. The rain appeared to bring down some element which burned the skin, and blackened brass work on steamers, the explanation accepted on shipboard being that the element was of a sulphurous nature. However, the rain rapidly washed the ashes away in the thinner places, making it possible to resume agricultural operations. Stock had to be fed on baled hay for a few days, and then grass began to push up in places with great luxuriance. The rich volcanic soil of Kadiak and the adjoining shores will be improved measurably by the volcanic ashes, in the opinion of the inhabitants of the section, after rains have completed the work of beating this fine ash into the soil.

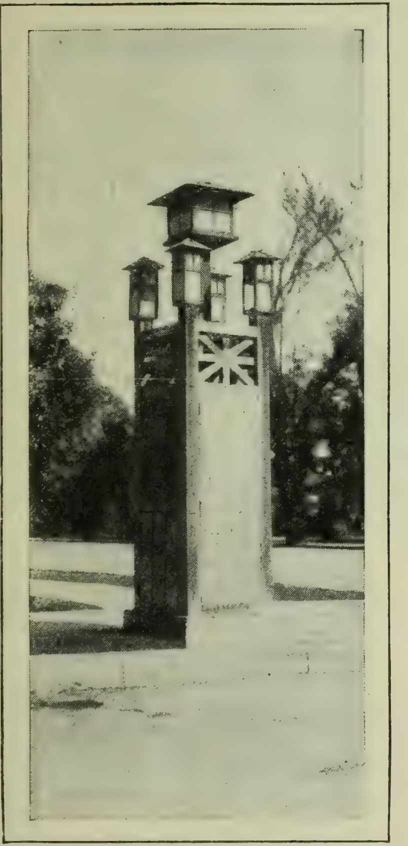
¶Smoke-abatement laws have been rigorously enforced in the Bengal province of India for the past 7 years.



ONE AEROPLANE IN FLIGHT PHOTOGRAPHED FROM ANOTHER AEROPLANE FLYING HIGHER IN THE AIR
In a recent aeroplane meet near London many striking views were taken from competing machines, this one being taken by a passenger in M. Verrier's biplane, flying at a height of about 2,000 ft., over Ealing, a suburban residence section. The monoplane pictured was at a height of about 400 ft.

MISSION LAMP STANDARDS FOR STREET LIGHTING

The residents of a small and exclusive residential tract in Los Angeles have set up especially designed mission lamp standards at the corners in place of the ordinary cast-iron lamp posts commonly used. These standards do much to beautify the neighborhood. Five rectangular lanterns of bronze and glass inclose the electric bulbs, and these are supported by a framework of unpainted timbers, which surround a substantial standard of dull red bricks, the whole resting upon a concrete foundation above the curb.


Artistic Mission Lamp Standards Used for Street Illumination in a Residence District of Los Angeles

LOCOMOTIVES AT EACH END OF TRAINS

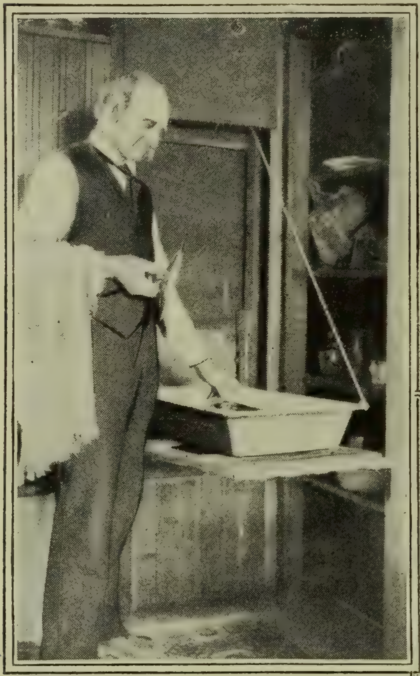
In changing from steam power to electric power for its enormous city and suburban passenger traffic, the Berlin Stadtbahn has decided to use electric locomotives, one at each end of all long trains, instead of having each coach fitted with motors to run separately. It is said 557 locomotives will be used with 690 passenger coaches and 29 repair cars. When two or more locomotives are coupled to the same train, as circumstances demand, these will be operated by one man by means of a simplified multiple-unit system. The assertion is made that experience gained with electric locomotives in Germany shows that maintenance costs are below those of motor coaches. The locomotive has large hauling powers and one such engine can therefore take the place of many motor coaches. Added to this, the motors and other electrical gear are very accessible, which is an important item from the point of cleaning and repairs. It also appears that since the motors of electric locomotives are spring-borne and placed high up in the body, there is less noise and vibration, as compared with motor coaches, and that they do less damage to the track. During the busiest hours of the day, when the traffic is heaviest, the trains will be made up of 13 six-wheel coaches, which will be propelled by two locomotives, one at each end of the train. At other times, when the railway is less busy, the trains will consist of five or eight cars, which will be coupled to a single locomotive. Trains made up in this manner can be driven from either end by fitting the last coach with a controller.

VIBRATIONLESS CONCRETE TABLES

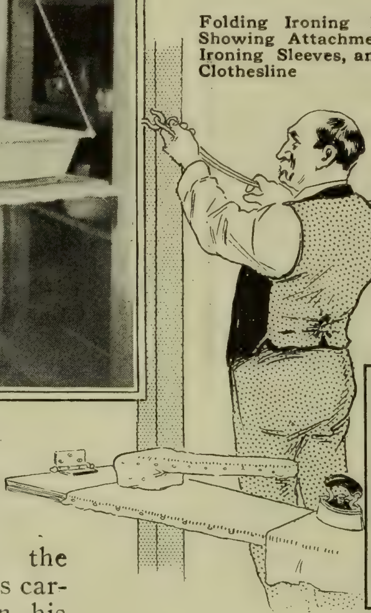
Concrete tables to give absolute freedom from vibration have been constructed for the Butte School of Mines, as standards for laboratory balances. The concrete pillar is built up from the solid earth through the floor, to the required table height, and the balances are placed on the top of the pillar. For convenience in operating the balances, a wooden table is built up from the floor around the pillar, but kept entirely free of the pillar on all sides, lest vibration be communicated.

LABOR-SAVING DEVICES IN AN INVENTOR'S KITCHEN

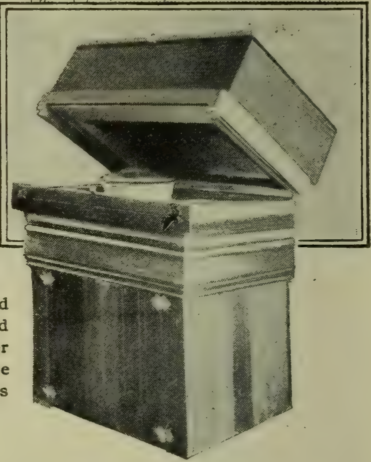
A Los Angeles inventor has busied himself lately with the problems of the housewife, endeavoring to plan conveniences which will make the lot of the worker in the kitchen easier. He has carried out the ideas in his own home and the result, although not perfect, contains in a rough-and-ready fashion ideas which may be developed into really practical labor and space-saving devices.



The Folding Kitchen Sink in Place for Dishwashing



Folding Ironing Board, Showing Attachment for Ironing Sleeves, and the Clothesline



The Combined Gas Stove and Fireless Cooker Which may be Operated as Either

Included in these ideas is a disappearing sink, the combination of a fireless cooker with a gas stove, and a folding ironing board having an attachment for ironing sleeves. The sink folds back against the wall when not in use and is concealed by a door. When dish-washing time arrives, the door is opened downward and becomes a support for the sink, which is at a height enabling the housewife to be seated while at work. The hot and cold-water faucets are in the wall over one end of the sink.

In the combined gas stove and fireless cooker the gas plate is boxed in a wooden case, lined with mineral wool and provided with an inner casing of zinc. When the hinged lid is thrown back, the device serves as an ordinary gas stove. Food which requires hours of cooking is brought to the proper temperature and then the cover is dropped into place, the gas being allowed to burn a minute or two longer to thoroughly heat the interior. A special intake and outlet for air is provided for the brief time during which the gas burns while the cover is down.

The ironing board folds back against the wall when not in use. In connection with it is a double clothesline on a spring reel. In use the loop end of the line is slipped over a hook at the farther side of the kitchen.

EYE INJURIES TO ECLIPSE OBSERVERS

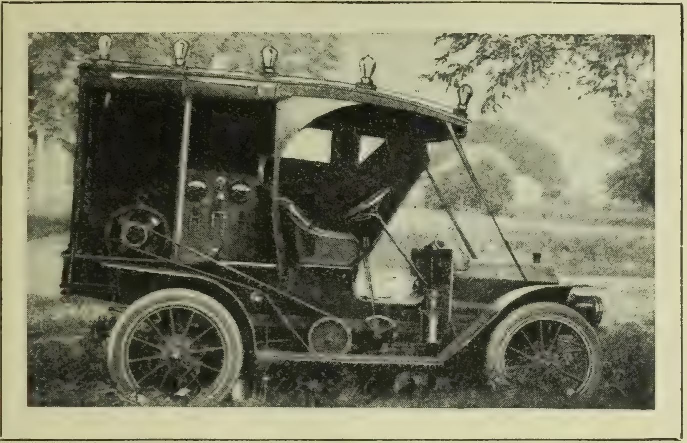
Eye affections, resulting from looking at the sun during a recent eclipse visible in Germany, were common in Berlin following close after the event. On the day of the eclipse the sky was clear and the maximum obscuration took place at the noon hour when thousands were on the streets. Some persons used smoked glass while others, ignoring newspaper warnings, viewed the sun through a hole pierced in pasteboard. Not a few gazed at the mighty orb without any protection and these suffered most. Many cases of injury done to the eyes were reported by oculists and physicians, one surgeon reporting 14 cases.

Besides ordinary cases of inflammation, instances of more serious visual disturbances were noted, many fearing at first that they were becoming totally blind. Some patients admitted they had stared a full minute at the sun while others declared they had looked at "Old Sol" not more than a few seconds. Fortunately most cases made a relatively quick recovery, but it is predicted that the next eclipse of the sun visible in the German capital will be viewed with extreme caution.

PICTURE-SHOW ELECTRIC PLANT IN AUTOMOBILE

A motion-picture showman, who travels from place to place, giving shows in a tent, has equipped his automobile with an electric plant for the operation of the motion-picture machine and for the 45 electric lamps in and around the tent and on the automobile itself. The electric plant consists of a 60-volt slow-speed dynamo which runs at 700 revolutions per minute.

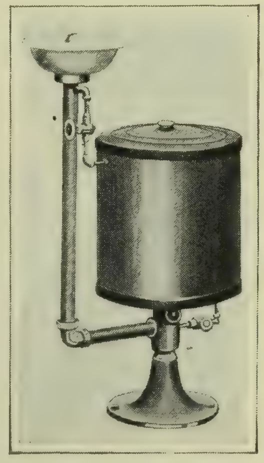
The owner of the outfit and his wife travel from town to town in the automobile, which has covered over 14,500 miles, and the tent, seats and other heavy equipment of the show are shipped by rail.



The Automobile Electric Plant Which Furnishes Current for a Traveling Motion-Picture Show

ICE-COOLED DRINKING FOUNTAIN

A bubbling drinking fountain with an arrangement for cooling the water by ice in a cooling tank is shown in the accompanying illustration. The cooling tank, which has a thick, cork-packed jacket, is equipped with a coil of brass pipe, and through this coil passes the supply of fresh water. The apparatus has a 1 ½-in. pipe standard and the waste bowl is of cast iron with vitrified porcelain enamel on the inside. The water supply is controlled by a self-closing



bibb and the water is furnished through a bubbler which regulates within itself the height of the flow of water. After adjustment, the height of the water remains essentially constant and is regulated so as to prevent contact between the mouth and the appliance.

RIVALRY OF MOTORMEN TO SAVE POWER

To reduce the cost of electrical energy and at the same time make the number of fares run as high as possible, the manager of an English street-railway system put into effect with good results a bonus system for the motormen and conductors. The saving in electrical energy is reported to have been 25 per cent.

The system was worked out on the basis of a 12-weeks' run, and first, second and third prizes in cash were offered for the best showing by motormen of each route at the end of that time. Consolation prizes were offered to motormen who made a showing below the car-mile average of the 12-week period. Meters were used to record the operation of each car. In order to make the test as fair as possible, each motorman was allowed to handle the same car throughout the period.

When this portion of the scheme was first put into effect, such keen rivalry developed among the men that they rushed by corners and failed to pick up passengers with the result that the savings made on electrical energy were lost in the passenger receipts.

The manager, however, had wit enough to put an end to this. He offered similar prizes to conductors turning in the most cash during the 12 weeks, over and above the average daily receipts on their routes. The result was the crew of each car came to an understanding. They agreed that they would both try to win prizes and split the money equally between them at the end of the period. The outcome of the double scheme was fine team work, more cash receipts, and the saving of "juice."

FIRE OR PANIC MENACE TO SKYSCRAPERS

Fire drills in every high building are urged by city building inspectors and others who have given thought to the dangers confronting the thousands hived in 20 and 30-story skyscrapers. The chief inspector of buildings for the Borough of Manhattan recently prophesied a disaster that will stagger humanity unless needed precautions are soon taken. So far as the construction of these buildings is concerned they are stated to be absolutely safe, but the disaster which is foretold is to come through fire or panic. It is pointed out that the proximity of stairways in many buildings to elevator shafts is one serious source of danger as, in case of fire, the shafts are likely to become

Suppressing the Revolt against the French in Morocco—A Chain of Prisoners being Taken to the Court Martial roaring chimneys. Other stairways and fire escapes are so constructed that a panic would almost certainly arise if they were used except where there is general knowledge of what to do in such an emergency. The feeling is rapidly growing that fire drills of some sort should be made compulsory by law in every high building, no matter how it may be occupied.

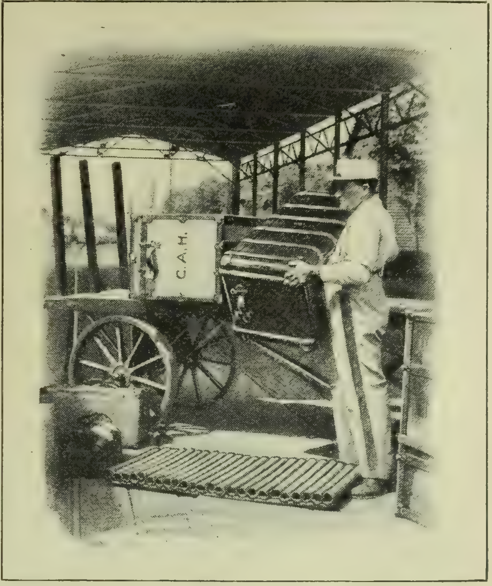
INTERNATIONAL WIRELESS REGULATIONS

An echo of the "Titanic" disaster is found in the resolutions passed at the recent International Radio Telegraph Conference held in London. It was decreed that the wireless station of a ship at sea should remain silent for a certain period of each hour, during which the operator should be watching for distress signals only. In such cases the distressed ship should control the field within her radius, and should it happen that a number of boats answer her distress call she shall determine, in order to avoid confusion, which of those responding is to remain silent. With respect to weather observations, it was decided these should be given right of way over commercial dispatches. Representatives of the United States, Great Britain, Russia, Germany, France, Italy, Spain and Portugal signed the resolutions.

PUTS AN END TO BAGGAGE SMASHING

Baggage smashing will soon become one of the lost arts if the simple and effective device shown in the accompanying illustration is put into general use. The cushion, or mat, upon which the trunk descends in unloading, recently was adopted by the Cumberland Valley Railroad and that company reports that it has proved very efficacious. The photograph shows it in use at one of their stations.

The cushion is composed of four strips of hard wood to which are nailed 24 pieces of scrap air-brake hose. The hose lengths are held in place by 1½-in. clout nails, driven through the strips of wood and clinched to the hose by means of an iron rod inserted while the nails are being driven. The cushions are 22¼ in. wide by 4 ft. 4 in. long.



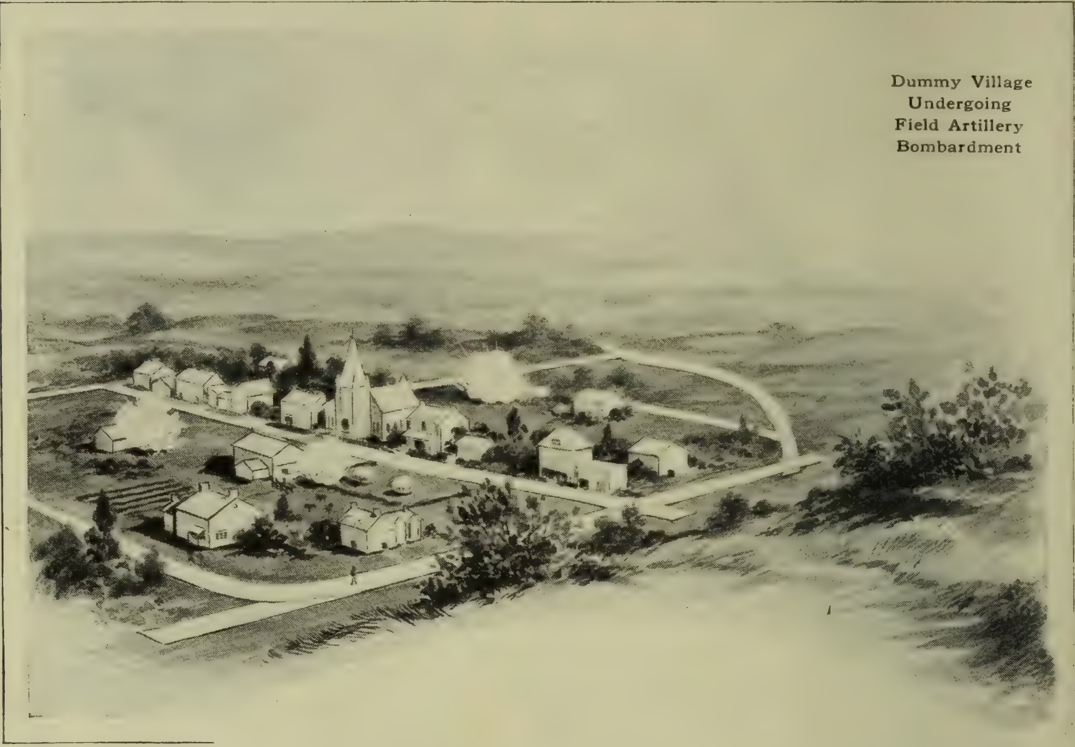
Cushion Baggage Protector Made of Wood and Scrap Hose

DYNAMITE IN BRIDGE CONSTRUCTION

Railroading in the West continually presents new problems to the construction engineer, but the use of dynamite in place of a saw was tried for the first time on a Santa Fe bridge over the San Joaquin River, near Fresno, California.

Concrete abutments and piers had been built under an old wooden trestle-type bridge and the principal girders of the new steel structure prepared and riveted together at a distance ready to be lowered into place from derrick trains. All the earlier stages of the new bridge had been constructed with the wooden bridge as a falsework and without interruption to traffic. But the floor of the wooden bridge was 15 ft. higher than the new steel structure was intended to be. To shorten the supports by sawing would take several days and tie up traffic.

The engineers got around the difficulty by running the derricks out to the proper points and then placing a small charge of dynamite in each of the wooden supports of the old bridge just 15 ft. below the roadbed. The dynamite shots were discharged simultaneously, the old bridge fell, and the entire steel structure dropped into place at once. It took but three hours then to lay the ties and rails.



Dummy Village Undergoing Field Artillery Bombardment

A DUMMY VILLAGE AS ARTILLERY TARGET

A fine example of the steadily developing idea of "more realism" in artillery target practice is forthcoming from England, where a dummy village was recently built as a target to be demolished by artillery fire. The village, constructed of canvas, comprised several cottages, barns and outhouses, an inn, school, hospital, and a church having a spire 36 ft. high.

Dummy Men before Bombardment of Village

The dummy village was constructed near Okehampton, in a rolling country, and the batteries were concealed two miles away. On a hill a mile and a half away from the doomed village were stationed military observers with range-finding instruments, to direct the fire, and to watch the progress of destruction.

By the time three batteries had completed practice everything was demolished with the exception of the church with its Red Cross flag flying, and the lyddite shells had blown great trenches in the street.

Shell Exploding, Photograph by Observer Half a Mile Away

¶An American breakfast-food concern is considering the advisability of manufacturing a variety of their staple product from the taro root of Hawaii, which is used by the natives for the making of their well-known delicacy, "poi."

ITALIAN MAIL BOXES EXCEL AMERICAN

Apartment houses in Milan and Genoa are equipped with mail boxes which in many respects are superior to those found in American buildings of similar type.

The apparatus is situated in the halls or vestibules and has the front appearance of a door, the upper part of which consists of individual letter boxes, one for each tenant, besides which there is a separate box provided for outgoing mail to be collected by the postman. Each letter box is numbered and each tenant has an individual key which cannot open any of the other boxes. The postman carries a pass key which opens all the boxes along his route. With one turn of his key he opens all the slits of the boxes as well as the collecting box, and causes to be thrown into view under the slits names of all the tenants. The placing of a piece of mail in a box automatically notifies the tenant by means of an electric bell. Simultaneously a white indicator drops underneath the slit of the box so that an absent tenant upon his return will know there is mail in the box, thus avoiding opening the box unnecessarily. The indicator disappears when the mail is withdrawn.

After distributing and collecting, a

One of the Batteries Directing Its Fire against the Dummy Village touch of a lever at the base of the apparatus closes all the slits and the names disappear. The device assures safety and privacy, making it impossible for peddlers or solicitors to obtain the names of tenants, or local tradesmen to clutter boxes with advertising matter. Just how it would appeal to the man looking for a friend at midnight with only a street address to guide him is another story.

LONDON CHURCH SPIRE AS LINCOLN MEMORIAL

The American tourist, entering or leaving London from the Waterloo station, gets a close view of the church spire shown in the accompanying illustration. If the tourist is wide-awake and receptive, he or she may give a start of surprise. It has actually got stars on it, likewise stripes, but it is probable that no one on the train could tell offhand what it means.

It is one of the ironies of history that this spire, erected in memory of Lincoln and remarkable as one of the most noticeable memorials to any native-born American outside the United States, stands half-forgotten already after so short a lapse of time. It rises to a height of 220 ft., surmounting Christ church, Westminster Bridge Road, made famous for the preaching of the Revs. Newman Hall, F. B. Meyer, and other divines well known on both sides of the Atlantic, and was built by the united subscriptions of Americans and British in 1874. It cost $35,000.

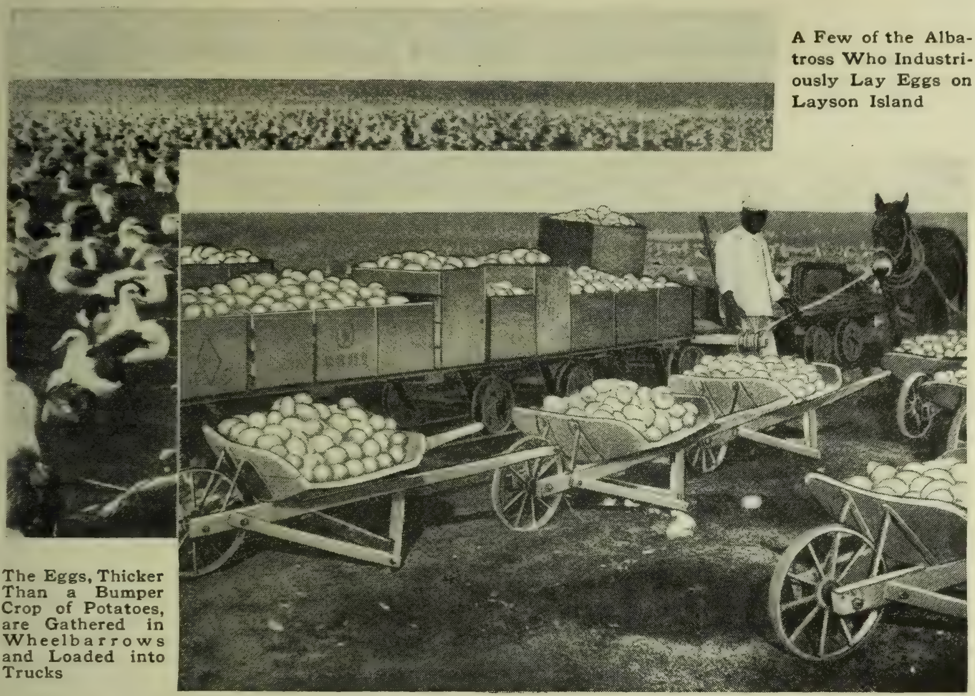
ELECTRICAL BRAINS FOR LOCOMOTIVE ENGINEER

An Australian inventor who has been working on the familiar lines of automatic stops for railroad trains has brought out an electrical signaling device which appears to do everything but think. The chief claim for it is that it will prevent the locomotive engineer from disregarding block signals. The tests which have been made of it seem to indicate that it will almost entirely remove the human element from block signaling and at the same time be free from many of the defects found in the systems now in use.

Suppose the apparatus were installed on a mile of single track between two sidings and that this track ran north and south. There is a train at each end approaching the single track. The station master decides that the northbound train shall have priority and so sets the control box at his end of the line. This control box is connected by a dead telegraph wire with "ramps" at each end of the section.

The northbound train proceeds and enters the section. The southbound train approaches the last part of the section on which it stands. As it does so it passes over one of the "ramps" and a shoe under the engine strikes it. Instantly a bell in the southbound engine cab rings an alarm. If the engineer ignores it, he is in trouble, for he passes over another ramp immediately and this automatically closes the throttle and applies the brakes. He can not get out of this predicament until he obtains a key to unlock the apparatus.

Meanwhile the northbound train has reached the ramps at the end of its section and received a warning of the same nature that the track ahead is



A Few of the Albatross Who Industriously Lay Eggs on Layson Island

The Eggs, Thicker Than a Bumper Crop of Potatoes, are Gathered in Wheelbarrows and Loaded into Trucks

not clear. If no attention is paid to the warning, the steam is cut off and the brakes applied.

Should an engine start out with a weak battery, should the telegraph wire be cut, or a short circuit result from any cause, the apparatus automatically stops the engine until repairs are made. Each time a stop of this kind is made the engineer must go to some authority for a key to unlock the mechanism, which would of course compel him to make a complete explanation.

The source of all power for this peculiar automatic signaling apparatus is a battery or generator carried on the engine. Batteries have been used on the engines which made the test on a standard-gauge track. There are no outdoor or fixed signals and this is said to reduce the cost of the equipment. Of course the trackwalker must be depended upon to keep the "ramps" free of snow in the winter time, but that is practically the only human element in the system.

EGG GATHERING WITH WHEELBARROWS

Egg gathering on Layson Island, a small rock in the Pacific not far from the Hawaii group, is a strenuous task, not in the seeking, but in keeping up with the egg producers and carting the eggs away. Millions of wild sea fowl, principally the albatross, make this island their home, and the eggs of this bird are collected in wheelbarrows, and loaded in trucks for transportation to the shipping point. About half a million albatross eggs are sold to the natives of Honolulu alone every season.

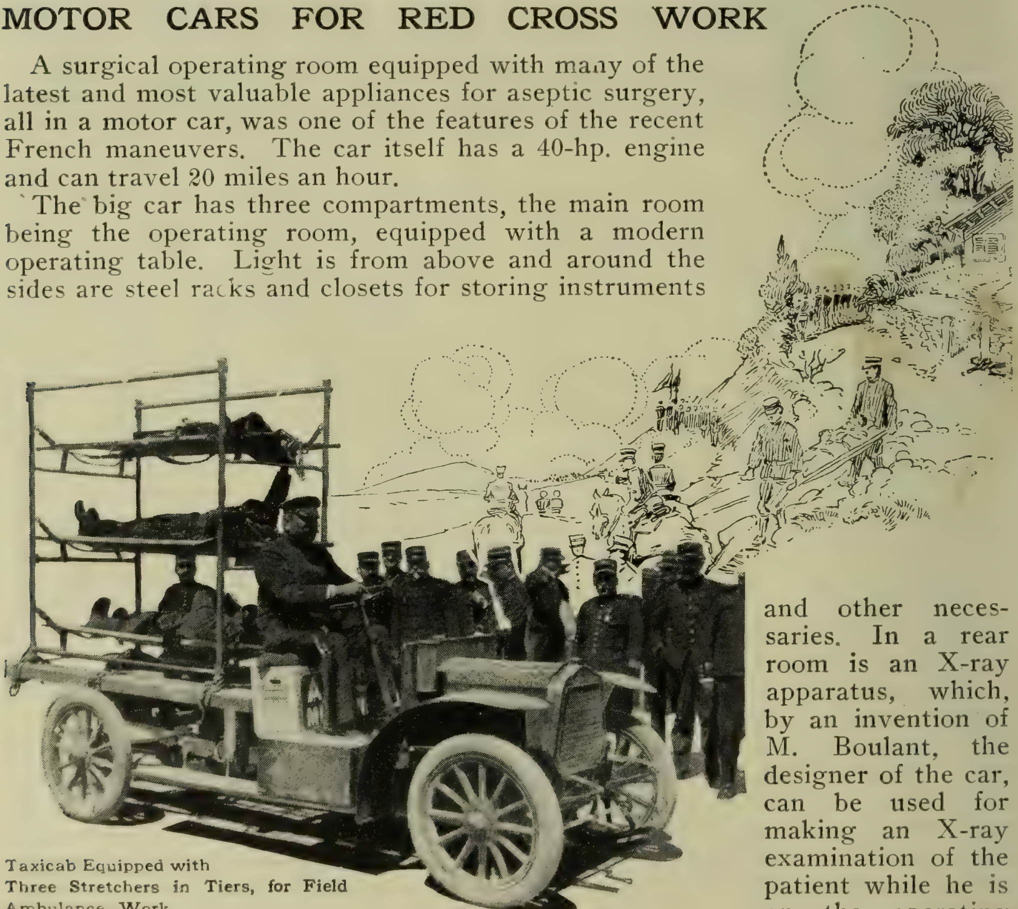
USING EARTH AS CONDUCTOR OF HEAVY CURRENTS

In adopting the Thury system of electrical supply for West London, experiments were carried on to determine the value of the earth for carrying heavy currents, which is a feature of this system. The object was to make sure that such use would not cause interference with other electrical systems nor result in damage to property. M. Thury had employed the method under consideration in Lausanne, Switzerland, with success, but in view of the different geological formation in London further experimentation was deemed necessary. It was decided that, in any event, the earth plates should be situated at a considerable depth below the surface and that connection with them should be made by insulated cables in order to avoid stray currents in the neighborhood of the plates. The experiments were aimed to ascertain to what depth the plates should be buried in order to escape induction, the size of plates to be used and their number, the distance apart at which the plates should be placed and the strength and permanence of the earth resistance. Holes were bored, each having a diameter of 7 in. and an approximate depth of 35 ft. This gave a current of 33 amperes per plate and it was considered that the plates could carry this current for temporary use. For permanent use it was thought six plates would be required so as to reduce the current one-half. The earth plates consisted of cast-iron pipes having an outside diameter of 6 in. and a length of 9 ft. In one district of London the plates were buried in London clay, and at the other experimental point in fine gravel, which was in the main very dry.

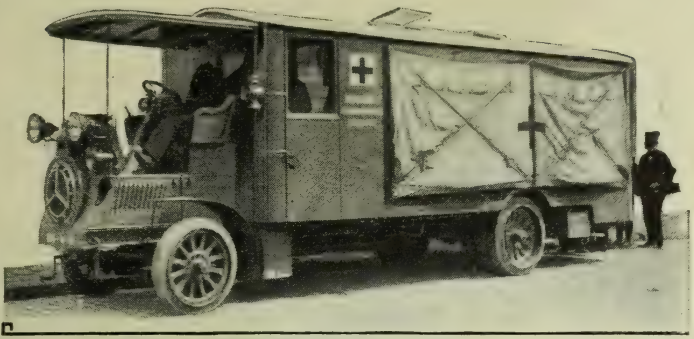
MOTOR CARS FOR RED CROSS WORK

A surgical operating room equipped with many of the latest and most valuable appliances for aseptic surgery, all in a motor car, was one of the features of the recent French maneuvers. The car itself has a 40-hp. engine and can travel 20 miles an hour.

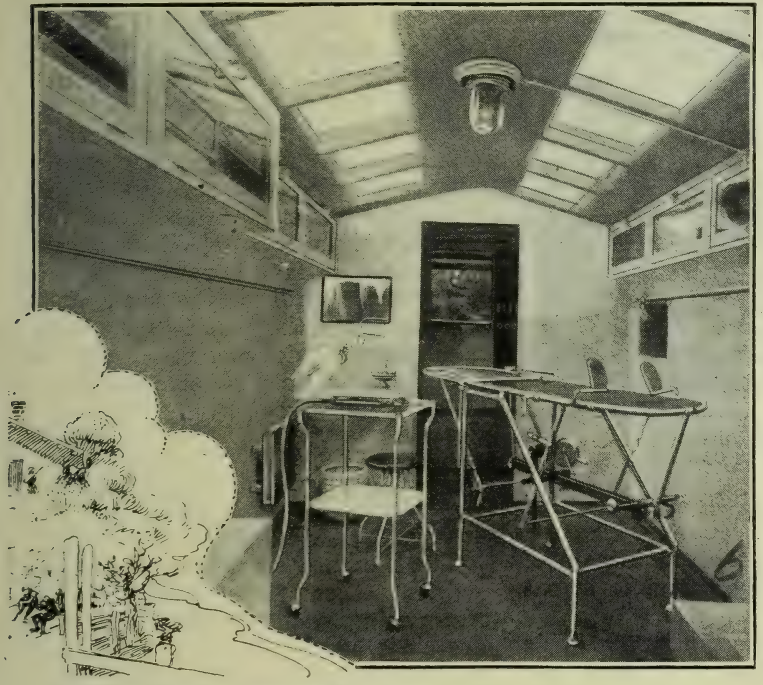
The big car has three compartments, the main room being the operating room, equipped with a modern operating table. Light is from above and around the sides are steel racks and closets for storing instruments and other necessaries. In a rear room is an X-ray apparatus, which, by an invention of M. Boulant, the designer of the car, can be used for making an X-ray examination of the patient while he is on the operating



Taxicab Equipped with Three Stretchers in Tiers, for Field Ambulance Work



Motor Car in French Maneuvers Equipped with All Modern Appliances for a Surgical Operating Room



Operating Room in the Motor-Car Hospital, Showing Operating Table and Overhead Light

table. In the front of the car is an electric dynamo, operating from the main engine of the car, for furnishing light and also current for an ultraviolet-ray water-sterilizing apparatus, which supplies water for hospital use and also for drinking purposes, and has a capacity of 3,750 gallons in 24 hours. From each side of the car a tent can be stretched out, furnishing room for cots for patients awaiting operations.

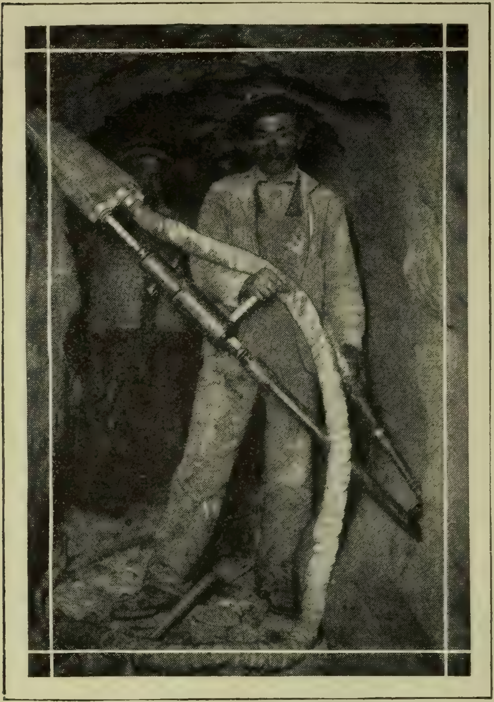
Many automobile ambulances for field use were tried at the same maneuvers, most of the attention being given to carrying as many stretchers as possible without crowding. One specially equipped car carried six patients, and a taxicab carried three stretchers in tiers.

The most noteworthy of these ambulances are shown in the illustrations.

DUST CATCHER FOR MINER'S DRILL

Dust from the operation of hammer drills in a mine is so apt to be a serious hindrance to work that a dust catcher has been devised in Leadville, Col., to be used when drilling in ore. It is said to increase the efficiency of the hammer drill 50 per cent and to minimize the danger from miner's consumption.

When the dust catcher is to be used, the hole is started with a bit, which drills a perfectly round hole to a depth of about 3 in., and the cone-shaped tube for dust catching is driven into this hole. The shank of the ordinary drill is then passed through a washer in the rubber end of the bag, the other end of the drill inserted in the tube and the narrow end of the bag slipped onto the tube, whereupon the drill is fastened in the chuck of the machine, and the work can go on.



Dust Catcher Attached to Miner's Hammer Drill Ready for Drilling Operations

It is claimed that the elimination of the dust is practically complete in the drilling that follows.

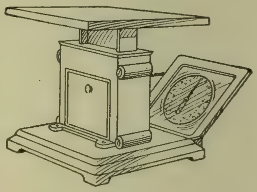
Until a few years ago hammer drills were scarcely used, so that the miner had little or no dust to contend with, but with its introduction trouble began. The miner is injured by "eating dust" which eventually may devolop into miner's consumption; the mine owner suffers loss of money, because whenever a miner drills a hole and is ready to change the drill, he must leave his work and get fresh air before he can continue, which means a loss of from 15 to 30 minutes on each hole drilled.

¶Former Fire Chief Edward F. Croker of New York is constructing a residence for himself that will be absolutely fireproof.

SWEDEN PROFITS BY WATERFALLS

That strict conservation of its water power is the aim of Sweden is shown by the maintenance of a waterfalls board which is engaged actively in the development of this source of national wealth. During the next 10 years several million dollars will be expended in carrying forward the plans for development outlined by the board. This expenditure is placed at about $4,000,000 for each of the years 1913-14-15; and between $2,500,000 and $3,000,000 for 1916 and 1917. For the remaining part of the decade the expenditures will not exceed $2,000,000 a year. The estimated revenue shows a continuous and rapid rise, from about $300,000 for 1913, to over $2,000,000 in 1923. Of course, only a nominal revenue will be received from falls bought for generating current until they are adequately exploited, but the board may decide to take over for development other falls for electrification of certain sections of state railways.

PLATFORM SCALES IN SIMPLE FORM

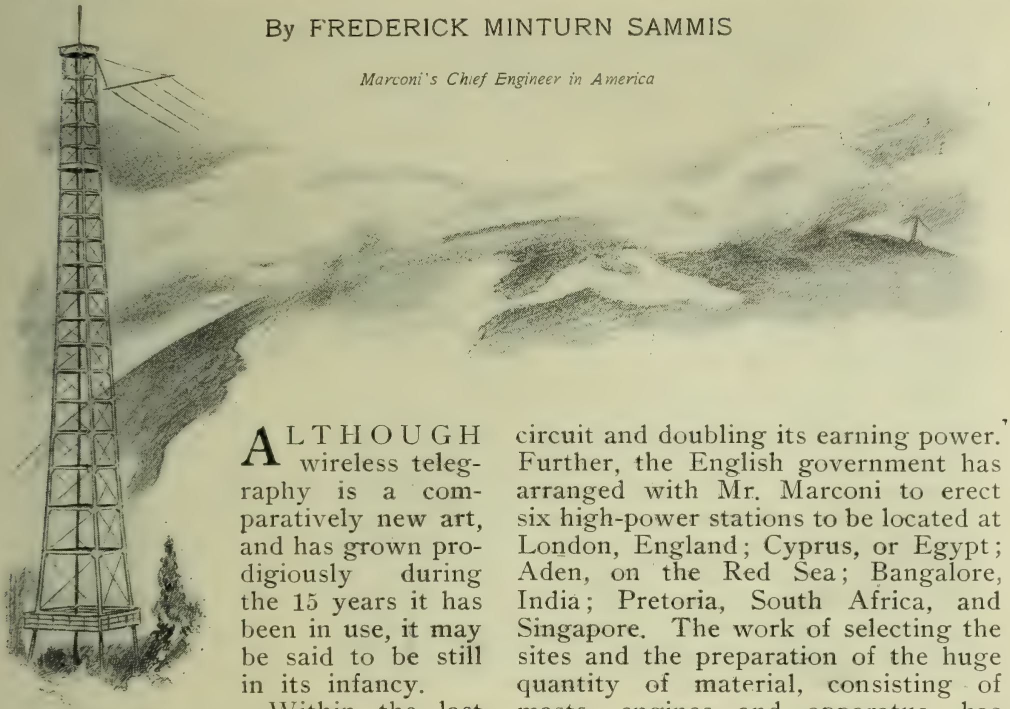


The increasing practice of people of weighing themselves daily, preferably after rising each morning and before dressing, has led a Frenchman to devise a scale which takes up very little room and is not expensive. The scales are of the same appearance as ordinary letter scales, though built very strongly so as to carry and register 275 pounds. A mirror inclined at an angle of 45 deg. enables the person standing on the platform to read the figures indicated by the pointer on the dial. An arrangement is attached by which the spring can be adjusted after continued use has altered its original tension.

AROUND-THE-WORLD WIRELESS

By FREDERICK MINTURN SAMMIS

Marconi's Chief Engineer in America

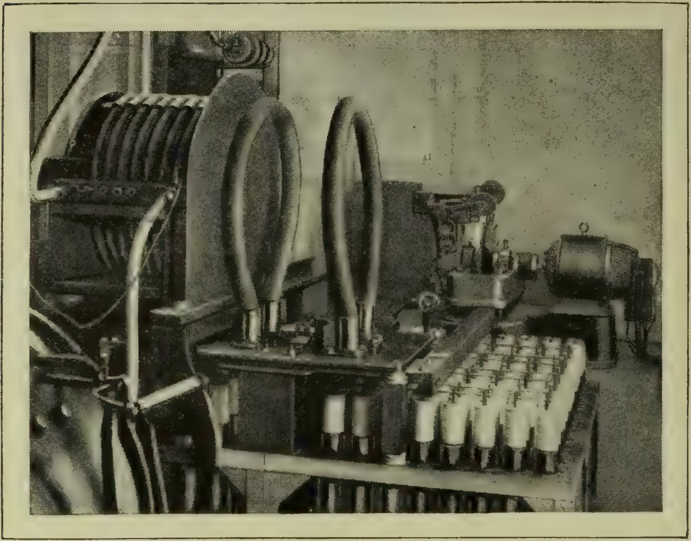


ALTHOUGH wireless telegraphy is a comparatively new art, and has grown prodigiously during the 15 years it has been in use, it may be said to be still in its infancy.

Within the last few months plans have been consummated for completely encircling the earth with a great chain of high-power Marconi stations.

In 1901 Mr. Marconi had completed a station at Cornwall, England, which for those days was considered colossal. From this plant of a hundred horsepower the initial experiments across the Atlantic were conducted. Mr. Marconi proceeded to Newfoundland and by means of a kite succeeded in elevating a copper wire to a considerable height and with this temporary receiving antenna he was able to detect the now famous letter "S," that was being sent by the powerful transmitter in England. At Glace Bay, Nova Scotia, a powerful station was then erected and, after much testing and remodeling, was opened for commercial service and for the past few years has worked daily, across the 1,700 miles of ocean, with the station at Clifden, Ireland. An additional site has just been acquired a few miles from the present Glace Bay station in order to make possible the simultaneous transmission and reception of messages, thus duplexing the circuit and doubling its earning power. Further, the English government has arranged with Mr. Marconi to erect six high-power stations to be located at London, England; Cyprus, or Egypt; Aden, on the Red Sea; Bangalore, India; Pretoria, South Africa, and Singapore. The work of selecting the sites and the preparation of the huge quantity of material, consisting of masts, engines and apparatus, has already begun and some idea of the magnitude of this work may be gained when it is considered that about 500 hp. will be required to operate each of these stations and that, exclusive of land, buildings and foundations for machinery, they will cost $300,000 for each station.

To the layman, a wireless station consists of a small and insignificant hut containing the wireless equipment and one or two masts or towers supporting the aerial wires, but it is probable that comparatively few readers have seen any of the really large Marconi transatlantic stations. These monuments of the inventive mind and untiring zeal of Guglielmo Marconi cover tracts of land over a mile in length upon which are erected a large number of huge steel masts which, in some instances, are 400 ft. high. The masts support a network of copper wires. These wires perform a dual function. When they are connected with the transmitting apparatus or spark gap they shake, with a mighty electrical force, the ether surrounding them and cause electromagnetic waves to become detached and travel away into space. When connected to the receiving apparatus they become the ear instead of the voice of the system and collect the vibrations that have been hurled into space at lightning speed by the distant station and lead them down to the sensitive receiving apparatus which corresponds to the drum of the human ear.



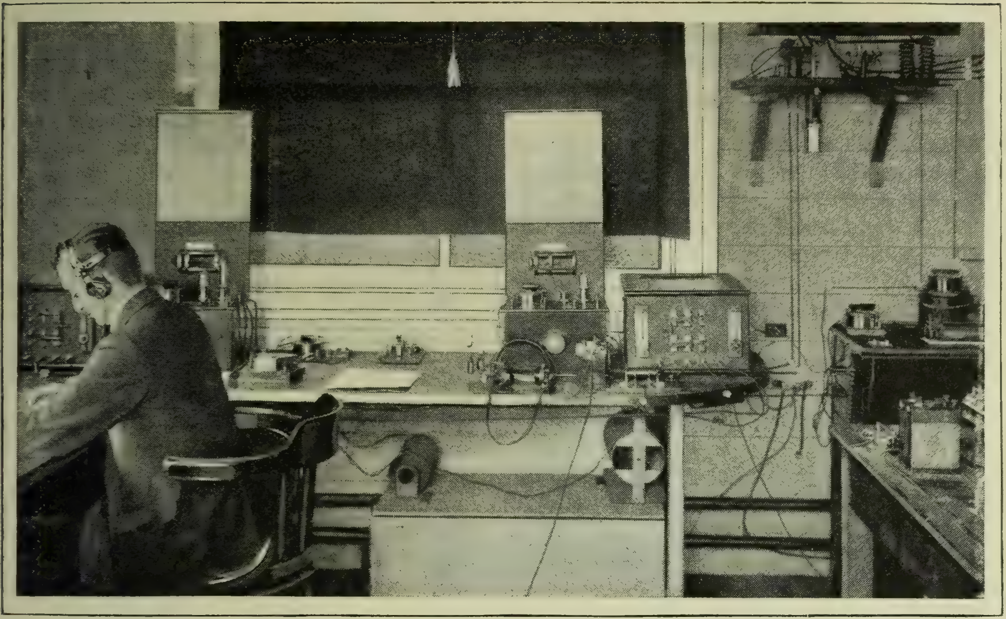
To Help Out the Big Stations are Medium-Power Feeder Plants, of Which This is an Example

It has been found practicable, by arranging the aerial wires in a particular direction, to cause the waves to travel almost entirely toward one point, whereas the old method sent them out in all directions like the waves caused by dropping a stone in the center of a pond. It will, of course, be evident that this improved method of working can only be utilized where fixed stations are concerned, and that ship stations and those shore stations that work with the ships must continue to use the original antenna, or aerial, that works equally well in all directions.

Until the present time our country has not been entitled to boast of a real high-power station, but now plans have been finished that will place the United States in the first rank with respect to both size and number of these modern high-power stations, and which, in conjunction with the stations being erected for the English government already referred to, will provide a commercial service that will encompass the earth. This station will be near New York City, at Belmar, N. J., where 500 acres af land have been acquired upon which the masts and plants will be erected. Transmission will be effected to the Panama Canal Zone and thence to Hawaii.

The Hawaiian station will be one of the most powerful of the entire group, for besides communicating with the station at Panama, it will be capable of working with San Francisco and the Philippine Islands, and with a station to be erected later in New Zealand. The Manila station is the last of the American group and will connect to the east with the Singapore station of the English group. Unbroken communication will be maintained successively through the stations at Bangalore and Aden. At the latter station we may turn southward over the huge mountains of Abyssinia and the wilds of German East Africa to communicate with Pretoria in South Africa. It is probable that the station at Pretoria will be called upon to communicate with the proposed high-power station at Buenos Ayres, soon to be started.

Retracing our steps to Aden on the Red Sea, we may talk with the station in Egypt to the north, and thence, by one tremendous leap, hurl a message with such force that it will cross the wide Mediterranean, ascend the boot of Italy, scale the ice-crowned Alps and drop quietly into London, all in less than one two-thousandth of one minute. Having arrived in England, we may take the present busy route from Clifden, Ireland, to Glace Bay, Nova Scotia, in order to talk with our



One of the "Stepping Stones" in the Wireless Circuit of the Globe: the Operating Room of the Clifden, Ireland, Station

Canadian neighbor, or we may utilize the new and more powerful station at London. By this means we arrive once more at our starting point at Belmar. Thus with but nine stepping stones, we may trip around the earth. Still further stations are contemplated: in fact, the chain that girdles the globe will be but the main artery of a great system. Feeders and branch stations will be established in all countries and a very comprehensive chain will be erected in South America in the near future.

With the establishment of this great network of stations will come an era of cheap communication, for wireless telegraphy may easily reduce the present cable rates. The cost of a submarine cable to cover a distance of 3,000 miles is anywhere from $7,000,000 to $10,000,000, while the total cost of a pair of wireless stations to do the same work is but $600,000. The cable must handle a half million dollars worth of business in order to earn enough to keep it in repair, while two per cent of this amount will take care of the same item for the wireless. Two million words at 25 cents a word will earn only a sufficient sum to cover depreciation of the cable, while the same number of words at half rate by wireless will produce enough to pay the depreciation charge and 35 per cent on the investment besides.

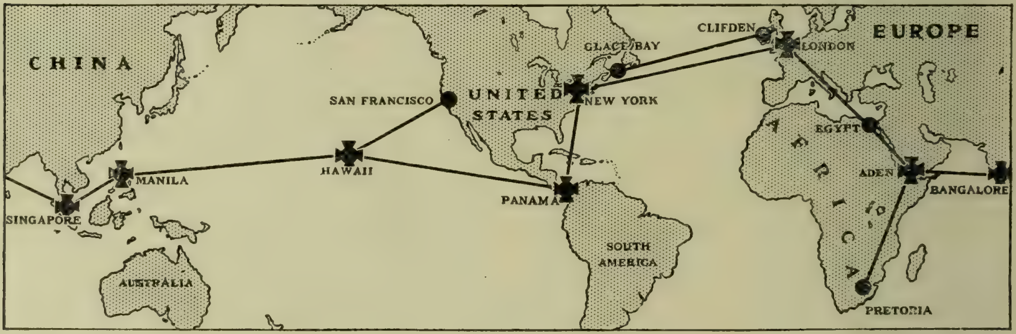
I have purposely omitted the cost of operation for there is little difference between the two systems. It is true that the actual cost of operation of the wireless system is higher than that of the cable, but the cost of repairs and upkeep on the cable are vastly higher than with the newer system. A cable company must keep a repair steamer, worth some $250,000, ever ready to sail out over the 3,000 miles of submerged cable in order to locate a break or fault and make the repairs, while the wireless station covers but a few acres and repairs are quickly and cheaply made.

The wireless system, in using nature's ether as a conductor, has provided itself with a medium that requires no repairs. At a high-power station one cannot help experiencing a weird sensation at this power to communicate from one continent to another over vast stretches of ocean with naught between, other than nature's ether. Without wire or cable to convey an electric current and a complete absence of anything that is perceivable by the five senses, it seems a marvelous thing to be able to communicate with a distant land. Yet it is more easily understood when we consider that we have borrowed for our use a voice of lightning that will speak thousands of miles with a single flash, and with apparent ease send its unseen and unheard vibrations through daylight and dark, through storm or calm, over mountains and seas and even directly through those substances which we have learned to think of as solids, with the exception, however, that they refuse to penetrate conductors of electricity.

Surely, we have here an accommodating servant by means of which we may from a single station talk with nations, north, east, south and west; we need no wires, no cables, no right of way and none of the expensive upkeep or repair that the older forms of communication require.

The engine room of the great station at Clifden, Ireland, is a fair example of the stations now planned. Each station has a complete duplicate set to guard against interruption of the service by accidental breakdown, for the handling of messages must continue day and night from one year's end to another, and even an engine and dynamo are sufficiently human to require an occasional rest. Near the engine is located the buildings that house the condensers. A condenser in wireless telegraphy is a device that stores up the electric energy until the operator by pressing his key sends it hurrying away to do his bidding. The entire plant, which may cover many acres of ground, is at the instant control of the operator who is stationed in a little bungalow quite separated from the power plant, but in absolute control of its machines by means of underground cables that operate switches in the main power plant.

Certainly the operator at such a station as the one building in Hawaii is an autocrat. He may tell the far-away station in the Philippines to proceed or to wait, or he may at the same moment talk to the San Francisco station and receive from the Philippines, or he may so arrange his automatic transmission and recording apparatus as to receive simultaneously messages from Colon and the Philippines, while at the same moment transmission to San Francisco is taking place from his own station.



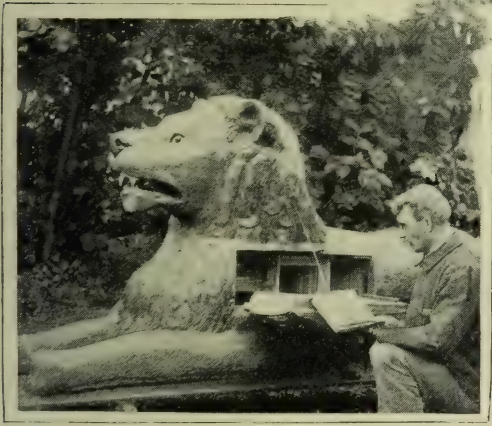
HIDING THE DOTS IN HALF TONES

Such obvious disadvantages, indicated by newspaper pictures, are inherent in the ordinary half-tone engraving process, by which the picture is made up of tiny dots in straight lines, that investigators all over the world are seeking an improved method. A new idea has been worked out by

Dr. Hans Strecker, according to the Scientific American.

He first prepares a mixture of gelatine and gum arabic, the gum forming in tiny globules, instead of mixing with the gelatine. The mixture is then coated over a copper or zinc plate which has been made sensitive to light in the usual manner. The coat hardens and so forms a film over the plate, of transparent gelatine, filled with tiny globules of gum, very uniformly distributed, but not very transparent. A photograph is then taken on this coated copper or zinc plate, the light affecting the plate through the transparent gelatine, but not through the globules of gum, exactly as an ordinary half-tone plate is photographed through a screen to get the dots. In the case of the new process, the image on the plate is also in dots, of course, but not in a regular pattern. The plate is then etched with acid in the usual manner, leaving an engraving cut which also gets its printing effect from tiny dots, but by reason of the less orderly distribution of the dots, they do not attract the eye so strongly as those of the common half tone, and the resulting print takes on a more lifelike appearance.

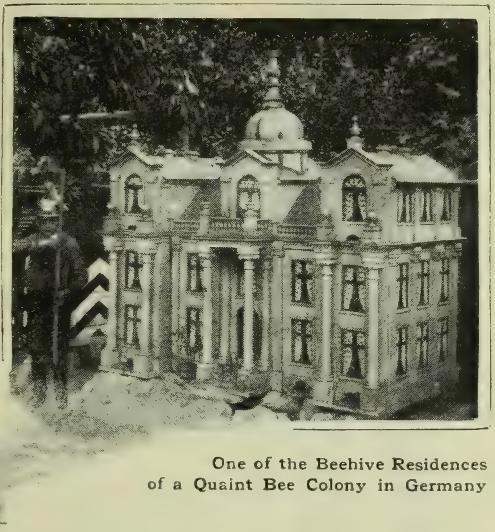
A Wooden Lion Whose Interior is a Beehive



It is possible to vary the distance apart of the tiny dots so as to adapt the engraving cut to any kind of print paper.

UNIQUE GERMAN BEE COLONY

Instead of the usual simple hives, all alike, a German keeper of bees has provided them with real residential abodes, as well as hives in the shape of wooden "wild" animals. In the garden are several miniature houses representing an inn, castle, railway station, and residences grouped around them. All the small details, such as chimneys, doors, windows, and the like, are carefully modeled in architectural proportion.

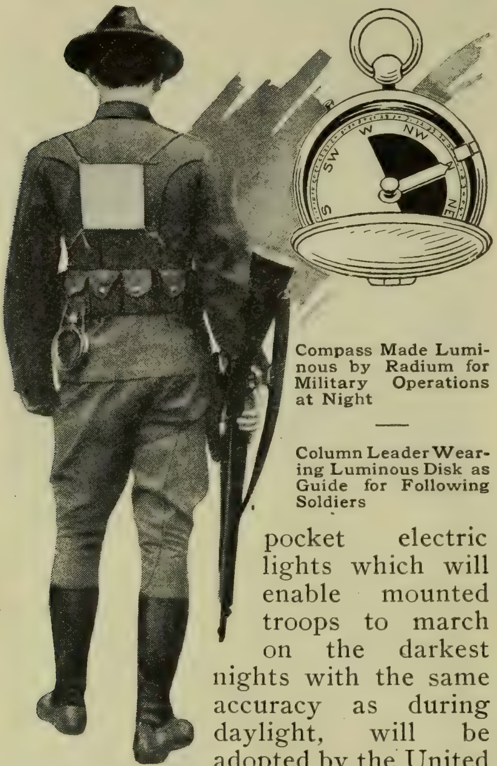


One of the Beehive Residences of a Quaint Bee Colony in Germany

FIRE-ALARM GONG OPERATED BY SPRINKLER SYSTEM

An eastern firm has recently placed on the market an automatic device to be used in connection with a sprinkler system which will ring a gong on the outside of a building as soon as the fire starts the sprinkler working. A valve, installed in the main pipe of the sprinkler system, is subject to the entire water pressure as soon as the sprinkler starts to work, and this allows a small portion of the water to drop on the buckets of a water motor inside the wall. The shaft of the motor extends through the wall and brings a rotating striker in contact with the gong.

LUMINOUS OUTFIT FOR NIGHT MARCHING



Compass Made Luminous by Radium for Military Operations at Night

Column Leader Wearing Luminous Disk as Guide for Following Soldiers

Luminous field compasses, luminous marking disks to be worn on the backs of the column leaders, and pocket electric lights which will enable mounted troops to march on the darkest nights with the same accuracy as during daylight, will be adopted by the United States cavalry, if experiments which are now being made at Fort Oglethorpe, Ga., prove their worth. The new appliances and equipment have been recommended by the Cavalry Equipment Board which recently met at the Rock Island arsenal where preliminary tests were made. The tests at Fort Oglethorpe will extend over six months and be made under conditions as severe as any encountered in actual warfare.

The equipment board has recommended that hereafter each regimental and squadron headquarters be supplied with luminous compasses of a type similar to those supplied to the armies of other countries, which have been found to be of great value in marching across a dark and unknown country at night. In the compasses, the usual index line and outside circle of degrees is retained, but instead of the dial being painted with luminous paint, which needs exposure to the sunlight or to a magnesium ribbon in order to render the compass luminous at night, the index line is treated with a composition in which radium enters as a constituent and which needs no exposure but is always ready for night work and retains its luminosity for an indefinite period.

In the tests at the Rock Island arsenal the luminous compass was used on a 500-mile march and also luminous disks of considerable brilliancy, made of waterproof cardboard, thickly coated with luminous paint and attached to the back of a column leader by means of pieces of tape. It was found that by these means the mounted troops could march with great accuracy and speed. When soiled the disk can be sponged off with lukewarm water and used many times before repainting is required. To excite luminosity, the disk must be exposed to bright daylight.

The use of pocket electric lights about 5 in. long and covered with durable leather is also recommended. It is believed the light will be useful to troop commanders in conducting night operations with other troops or even independent night operations on a small scale; and in reading dispatches, examining crossings and banks of streams before fording. The lights will be so constructed as to be proof against wet weather and tropical temperatures.

The board has also recommended that the bayonet be added to the trooper's equipment, so that in case he is unhorsed, he will be as efficient as an infantryman. The type of bayonet recommended is not unlike that used in other branches of the service, but about 4 in. shorter and not quite so heavily constructed.

ℭA western railroad company has not only given its employes thorough instruction in first aid to the injured, but has equipped its trains with the so-called "first-aid" packages.

PREVENTING EROSION OF PROPELLERS

"Turbodium" is the name given an alloy, produced after numerous tests, which is now successfully used to prevent erosion of propellers of turbine-driven vessels. In laboratory tests it showed an endurance of 140 hours, as against 24.7 hours for the ordinary high-tension bronze, which also has been used for the same purpose. The test has been confirmed by use of the alloy for periods of six months to three years, propellers so protected having shown no evidence of erosion after the lapse of these varying periods. Before turbines were introduced, manganese bronze temporarily solved the problem of preventing erosion in the earlier type of propellers, but with the use of the new-style engines, an alloy of greater resistance was required.

GETTING READY FOR AERIAL INVADERS

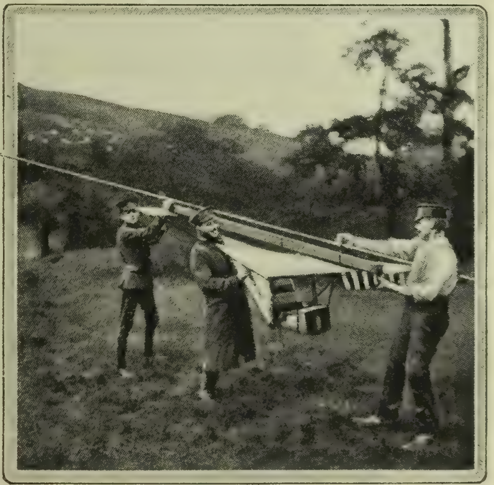
The possibility of an aerial invasion of England has occupied the attention of British military authorities since the first aeroplane crossed the English Channel. The accompanying illustrations, used by courtesy of the Illustrated London News, show that preparations are being made to give the first soldier-birdman a warm reception.

Model Aeroplane Target with Dummy Pilot in Full Flight as It Would Appear to Marksmen on the Ground

To gain practice for such a contingency a model aeroplane, 10 ft. long, has been mounted on a wire stretched across the rifle range in Broadhead Valley, Entwistle, near Bolton. The model carries a dummy pilot which becomes the target during maneuvers. In practice the model, out of sight of the attacking force, is released by means of a rope and passes over the riflemen at full speed. During a recent trial the "pilot" was hit by a bullet at a distance equivalent to 1,000 yd. for a full-size aeroplane. Another shot struck the machine but missed the dummy driver.

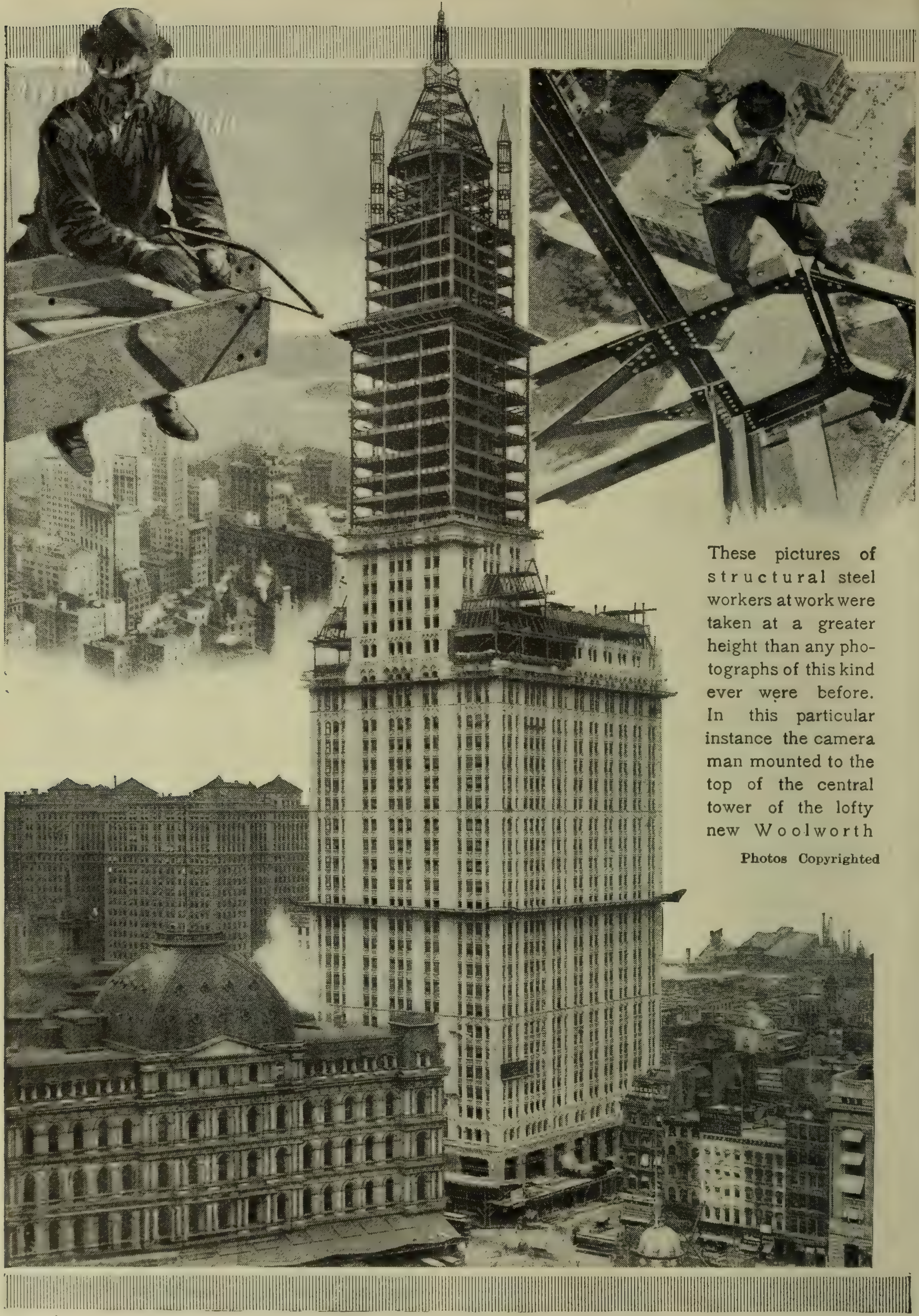
ASK BIDS TEN YEARS IN ADVANCE

The city of Dublin in asking bids on arc lamps has given the manufacturers a big problem. The specifications call for bids on 500 lamps to be delivered at the rate of 50 a year for 10 years. The lamps are to burn in series of 22, and the makers have been asked to submit one series for a six-months' free test on the same circuit as the lamps now in use. These difficulties might have been overcome, but the makers refused to bid when they found that the specifications provided that each light must have a heavy sheet-copper case. They said it was impossible to forecast the price of copper for 10 years in advance.



The Way in Which the Model Aeroplane is Attached to the Rope Before It is Released to Become a Target

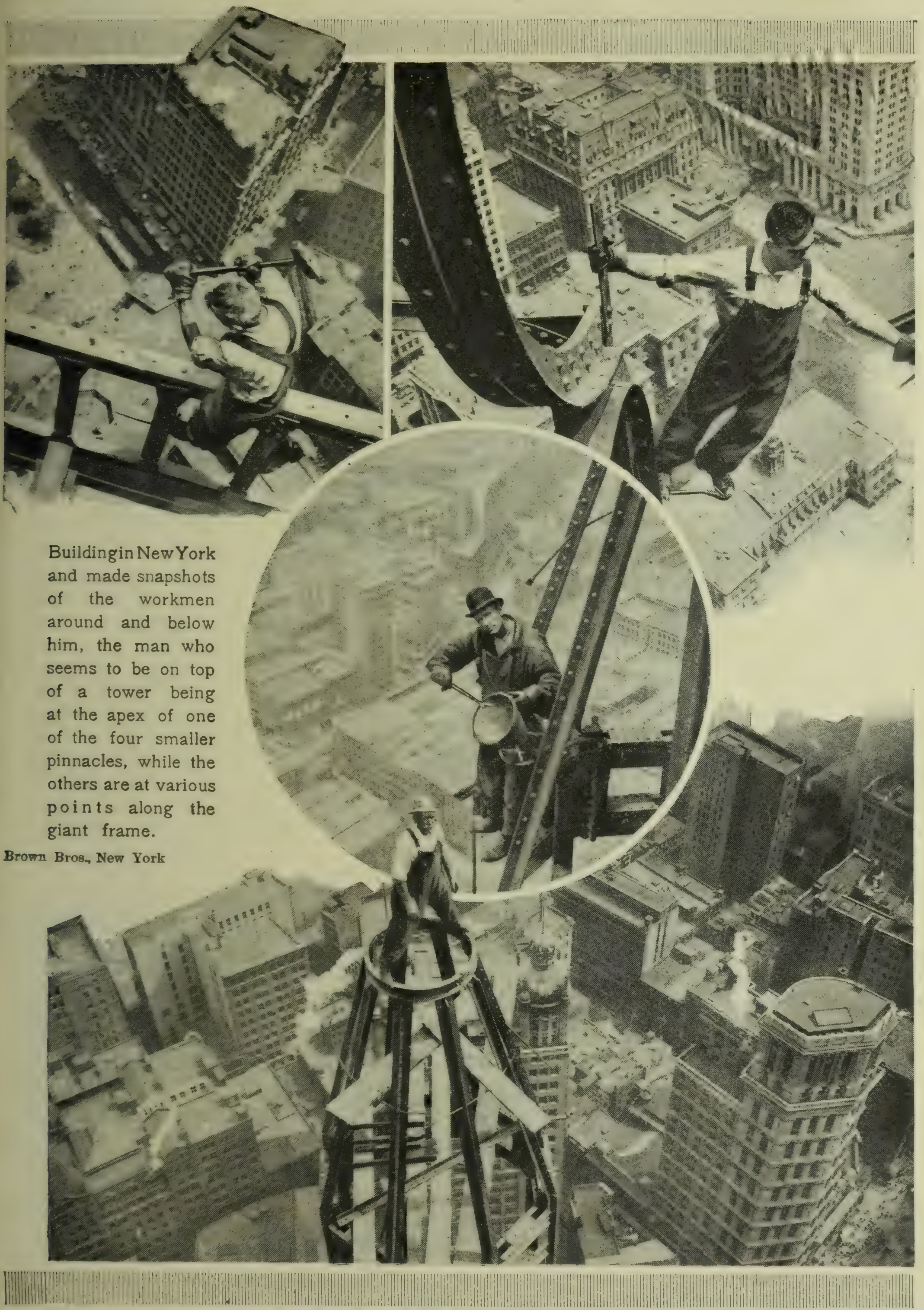
SKY-SCRAPING PHOTOGRAPHS



These pictures of structural steel workers at work were taken at a greater height than any photographs of this kind ever were before. In this particular instance the camera man mounted to the top of the central tower of the lofty new Woolworth

Photos Copyrighted

OF SKY-SCRAPER BUILDERS



Building in New York and made snapshots of the workmen around and below him, the man who seems to be on top of a tower being at the apex of one of the four smaller pinnacles, while the others are at various points along the giant frame.

Brown Bros., New York

MICROBES FROM DOGS TO PROLONG LIFE

In making his recent announcement that he had found microbes in the intestines of dogs which are hostile to the microbes charged with bringing on premature old age, Prof. Eli Metchnikoff showed the French Academy of Sciences cultures of these friendly microbes. Professor Metchnikoff considers this discovery of his a long forward step in his famous efforts to find means of extending what is the present apparent normal span of life.

Culture of Life-Prolonging Microbes Found in Dogs

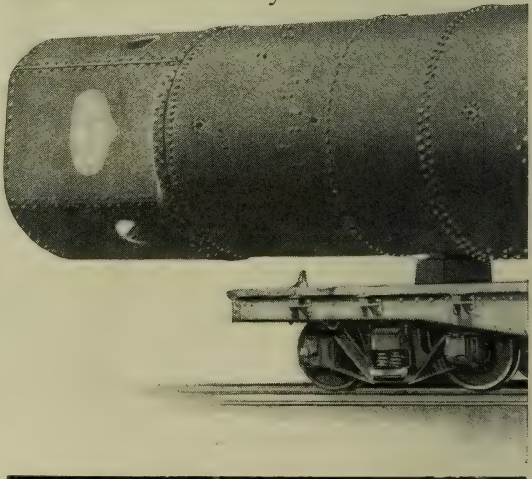
Professor Metchnikoff and Doctor Wollman, his collaborator, have become convinced in the course of their recent investigations that it is in the herbivorous or non-flesh-eating animals the harmful microbes are developed in greatest numbers, and that this will apply to people who are strict vegetarians, while in persons using a mixed diet comparatively few are found. In announcing his discovery of the friendly microbes in dogs Professor Metchnikoff issued a warning against considering his discovery as yet anything more than laboratory experience, and entirely preliminary, and against any unscrupulous exploitation of his discovery.

MOST POWERFUL LOCOMOTIVE IN THE WORLD

The Mallet locomotives just built for the Virginian Railway are claimed to be the most powerful in the world. The locomotive and tender weigh 752,000 lb., the fire box is large enough to hold a donkey switching engine, and the weight on the 16 driving wheels is estimated to be 479,200 lb. It is estimated that these locomotives will haul 155 loaded 50-ton freight cars at 10 miles an hour.

STREET PAVING LIKE MOSAIC FLOOR

Because of repeated unsuccessful efforts to find a satisfactory pavement for heavy traffic, the engineers of the city of New York are preparing to lay a new form of granite block, known in Europe as "durax pavement." In the continental cities it has proved stronger and more durable than any other type of paving, and New York hopes to benefit by their 20 years' experience with it. Its lasting qualities are due to the fact that the surface blocks are small, carefully fitted by hand, and so arranged that none of the joints is at right angles to the moving lines of traffic. This produces an almost noiseless surface and gives a good foothold for horses. The blocks are made of granite, cut in cubes about 3 in. on each side. On a bed of ordinary dirt or clay, which is pounded down hard with a 10-ton roller, a foundation of concrete, 6 in. or more according to the weight of the traffic, is laid, and over this is a ½-in. bed of granite chips. The granite cubes are then laid on top and fitted together as evenly as possible. The interstices are filled with pitch. When completed, the street looks like a great piece of mosaic, the lines of the cubes curving off into regular arcs in various directions. The surface at first is slightly rough, but after a few days or weeks it becomes very smooth.



THE KING'S BARGE FOR THE HENLEY REGATTA

The royal barge which was originally built by William III, of England, for the use of his consort, Queen Mary, some 200 years ago, was thoroughly overhauled before the Henley Regatta, which is the premier water event of the season in England.

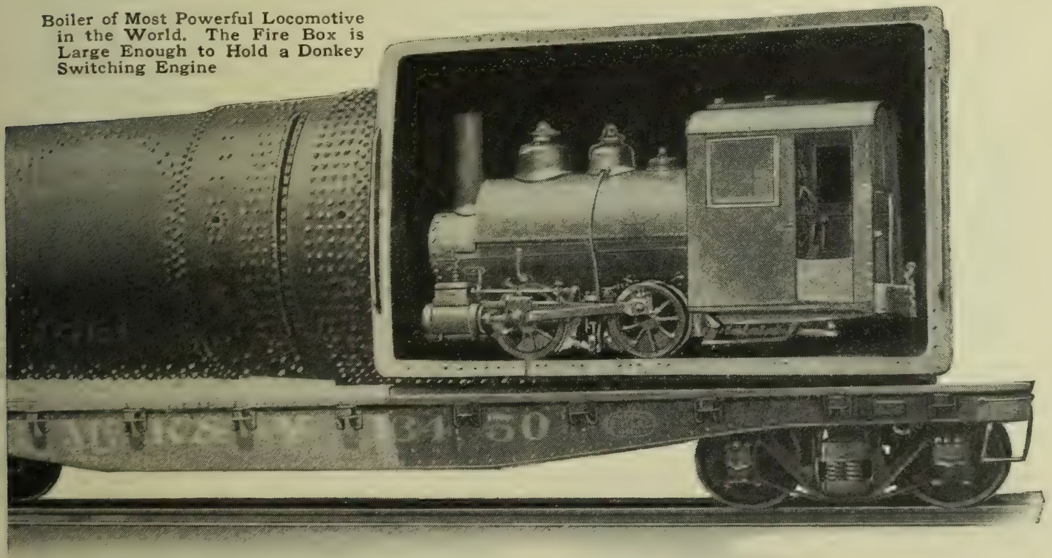
The Royal Barge of William III, of England, Undergoing Redecoration for King George

TRANSMITTING SKETCHES BY WIRELESS

Surprising results are being obtained by means of the new invention of an Italian youth, Francesco di Bernocchi, called the wireless iconograph, which has recently been tested between Milan and Turin. His apparatus is far in advance of anything of the kind yet recorded. Besides ordinary messages, it also transmits autographs, shorthand characters and all sorts of designs. So simple is the arrangement that the transmitter and receiver of this instrument may be applied with ease to any ordinary wireless telegraph plant.

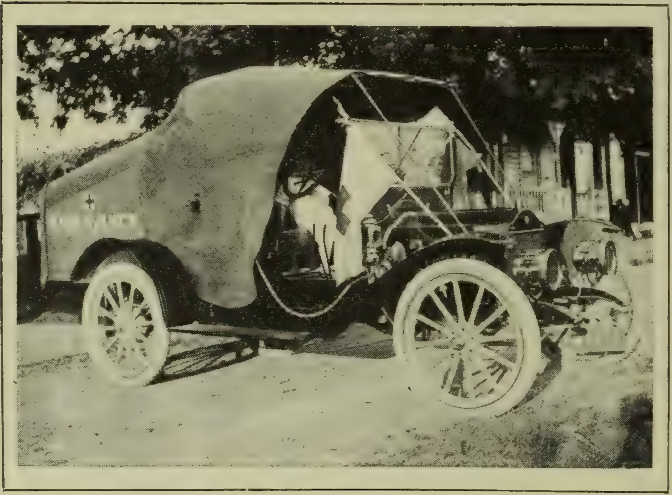
General Spingardi, the Italian minister of war, is so much impressed by the enormous advantages of the wireless iconograph for transmitting orders and conveying sketches in time of war with the utmost secrecy, that steps were immediately taken to secure for the Italian government exclusive possession of the patent.

Boiler of Most Powerful Locomotive in the World. The Fire Box is Large Enough to Hold a Donkey Switching Engine



AN IMPROVISED MOTOR AMBULANCE

A physician at Wildwood, N. J., has converted an automobile into an ambulance, as shown in the accompanying photograph. The rear end of the ambulance is 3 ft. high with isinglass set in the top cover to give light to the patient. An opening back of the seat permits conversation between physician or driver and the patient. The ambulance is used in connection with a seashore emergency hospital.



Physician's Motor Car Converted into Ambulance

DYNAMITE DOES WORK OF SLEDGE

Expedition in making repairs is a thing devoutly wished when the water supply of a big industrial plant is temporarily shut off. With this in mind the waterworks manager of Birmingham, Ala., has adopted the use of dynamite in place of sledges for breaking cast-iron pipes when it becomes necessary to dislodge them. A quarter to one-third of a stick of 40 to 60 per-cent dynamite is placed on top of the main and covered with clay. Usually the blast blows out a small hole or starts a crack. Further shots are then exploded, working toward each end of the pipe. In some instances pipes thus removed were 2 in. thick and the dynamite method was found much more rapid than the old way of attacking the pipe with sledges. In doing this work electric exploders are recommended as they may be used with greater safety and are more convenient than fuses.

PHOTOGRAPHING ANIMALS UNDER WATER

Photographs of otters and water birds of various kinds have recently been obtained with a moving-picture camera by Dr. Francis Ward, of Ipswich, Scotland. In order to get the pictures and remain unobserved by the animals Doctor Ward built a concrete tank fitted with a window and mounted his camera in an underground room behind the aperture.

Among the pictures obtained are those of an otter engaged in a fish hunt, herons, penguins, black-backed gull and a water hen. The penguin was observed as a fisher, the photographs disclosing clearly how the bird uses his wings as oars both on the surface and while under the water. The air bubbles in the feathers of the water hen convert it into a mirror in which are reflected the colors of its surroundings. The fish are seen swimming around the legs of the heron which piece of carelessness enables the bird to gain a square meal without undue exertion.

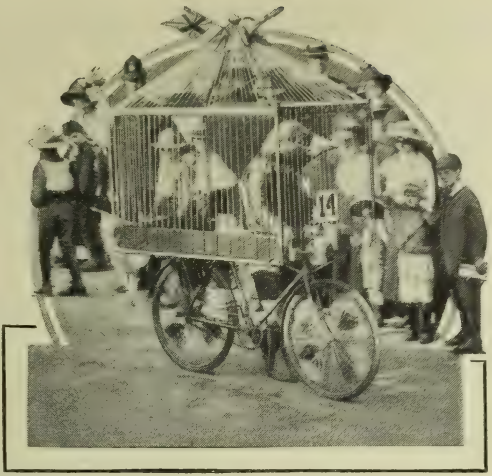
DISINFECTING WATER BY ELECTRICITY

Satisfactory and economical disinfection of swimming tanks has been accomplished by the municipality of Poplar, England, by means of an electrical discharge into the water which renders it sterile. The cost of the installation required for this purpose, it is said, was more than repaid by the saving of expense for disinfectants of the usual kind that had been employed previously. The effect on the water is not such as to make it unpleasant for the bathers. An English physician states that considered as a possible means of infection, it is a matter of surprise that comparatively little attention heretofore has been drawn to the dangers lurking in swimming baths.

CARRYING A LOCOMOTIVE ON A CABLEWAY

The giant hands that are refashioning the surface of the earth at man's bidding do something more than merely pile up heaps of rock in river courses that the streams may be diverted to fields where water is needed, or tunnel through mountains, or level off hills. Recently it was necessary to carry a railway locomotive from one side of the Rio Grande River to the other in connection with the construction of the Elephant Butte dam. To run the engine on rails to the nearest switching point and thus get it to its destination would take too long. So the power that has been trained to exert itself at the twist of a switch or the turn of a throttle was called into play and it picked up the engine and carried it across the river. There was a cableway of steel ropes stretched from one side of the river to the other for the purpose of transporting material as needed. The cable swings 300 ft. above the surface of the river. The locomotive, a 20-ton affair, was equipped with slings which were in turn attached to the travelers on the cable and it was easily and quickly transported from one side to the other.

℄ The illustration of the Galveston causeway in the August issue of this magazine, through an error of omission was not credited as it should have been, "Copyrighted, by Maurer, Galveston."



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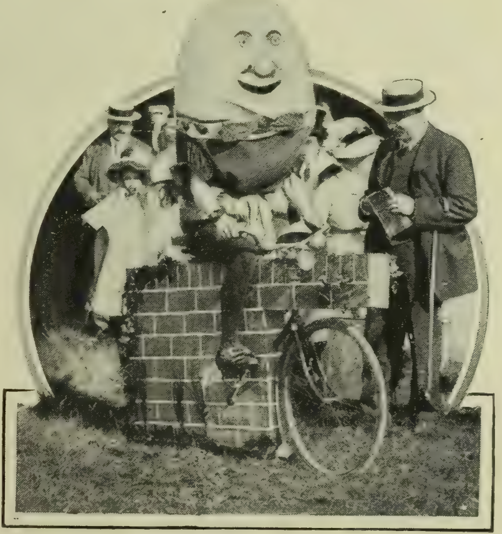
Canary in Bird Cage, Appearing in English Bicycle Meet

GROTESQUE MAKE-UPS FOR BICYCLISTS

Bicycle meets still persist in England. Two quaint figures mounted on bicycles were features of the fifteenth annual meet of cyclists held recently at Woodford, England. One of the riders represented a canary, while the Mother Goose character, Humpty-Dumpty, mounted on the famed wall, operated the pedals of the other bicycle.



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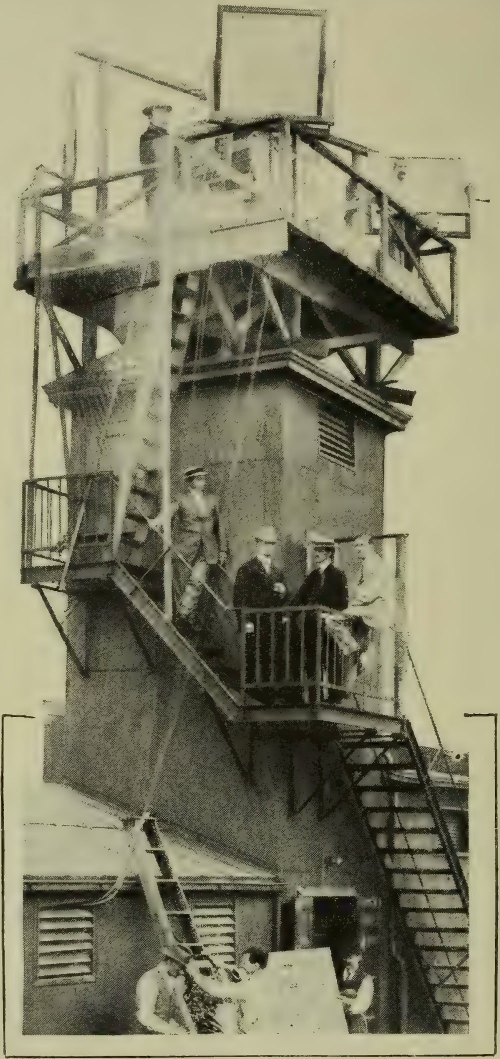
Humpty-Dumpty Sitting on His Wall and Riding a Bicycle

VARI-COLORED SEARCHLIGHT DISPLAY IN BALTIMORE

Shafts of white, red, green, orange, pink and yellow light, projected by an immense searchlight mounted on top of the Fidelity Building, one of the highest points in downtown Baltimore, have been attracting the attention of visitors in that city. The desire to produce spectacular effects other than those attainable with white light led to the construction of the apparatus that afforded an alternating rainbow of light more startling than the coat of Joseph.

The apparatus, which is shown in the accompanying photograph, consisted of a supporting platform, the searchlight proper, a motor for revolving the light, four large oscillating mirrors and four color screens. The mirrors were placed one each at the four corners of the platform railing. Each mirror was held by a universal-jointed frame so constructed that any or all of the mirrors could be set at any desired angle to the beam of light. Over the center of the searchlight was hung a horizontally revolving wheel or frame carrying the color screens. Each of the screens projected perpendicularly downward a sufficient distance so that its center corresponded with the center line of the horizontal searchlight beam. With the searchlight revolving automatically in connection with the inclined mirrors the operator rotated his color screens. Instantly the beam, however deflected, became surcharged with color. The beam of light projected was 24 in. in diameter.



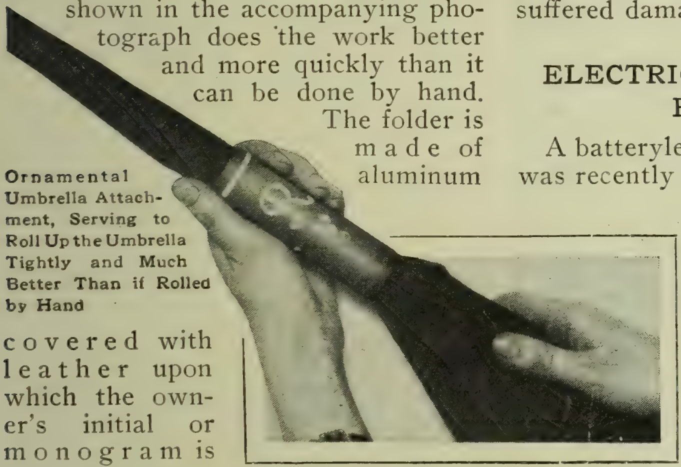
Searchlight Color-Flashing Apparatus on High Baltimore Building

NEW GAS ENGINE FOR BATTLESHIPS

The new marine engine, invented by Dr. H. Junkers, professor of the Aachen (Germany) Technical Highschool, is advocated by its creator as being suited not only to commercial vessels but also to battleships. In a paper read by Professor Junkers before a technical society recently he indicates how his engine was evolved from an earlier German type of gas engine. Included in his paper were drawings showing the theoretical distribution of engines for a 26,000-ton battleship of 45,000 hp. Four shafts are provided, each unit consisting of a six-crank engine with its compressors. Comparison is made between the Junkers engine, which in this case is of the tandem type, and engines of the ordinary double-acting variety, the power per crank in each case being assumed to be 1,875 hp. Objection has been made to the Junkers engine by engineers who have asserted that it would be very high and therefore suited only to big cargo vessels of comparatively low power. In these plans the adoption of a short stroke, rendered possible by the double-piston principle, makes the engine lower than the double-acting type.

ARTISTIC UMBRELLA ROLLER

An umbrella folded clumsily is about as ungraceful an object as may be found. The novel umbrella folder shown in the accompanying photograph does the work better and more quickly than it can be done by hand. The folder is made of aluminum covered with leather upon which the owner's initial or monogram is stamped. The tube is held in one hand while with the other the umbrella is inserted, lower end first, after which it is slowly turned until the upper part of the "shower-stick" is reached. The folder is an English invention.



Ornamental Umbrella Attachment, Serving to Roll Up the Umbrella Tightly and Much Better Than if Rolled by Hand

SHORT-CIRCUIT FIRES CAUSED BY BIRDS

Panic among a flock of starlings, brought about by the attack of a sparrow hawk, was the extraordinary cause of a series of fires breaking out simultaneously in Württemberg, Germany. The starlings flew blindly toward a transformer house and some of the birds became entangled between the inductance spirals and the insulator pins. As a result the transformer-house tower was connected with a 10,000-volt line and, it is said, if the ground connection had been effective the rush of current would have been sufficient to open the main-station breakers. Unfortunately, only one ground plate had been provided and after an exceptionally dry period this was found to be in dry soil, hence the high-tension charge took the easiest way to earth which happened to be by way of various house installations. Immediately several fires resulted and in attempting to extinguish them with water a number of persons received violent shocks. None was seriously injured, however, and only one house suffered damage of consequence.

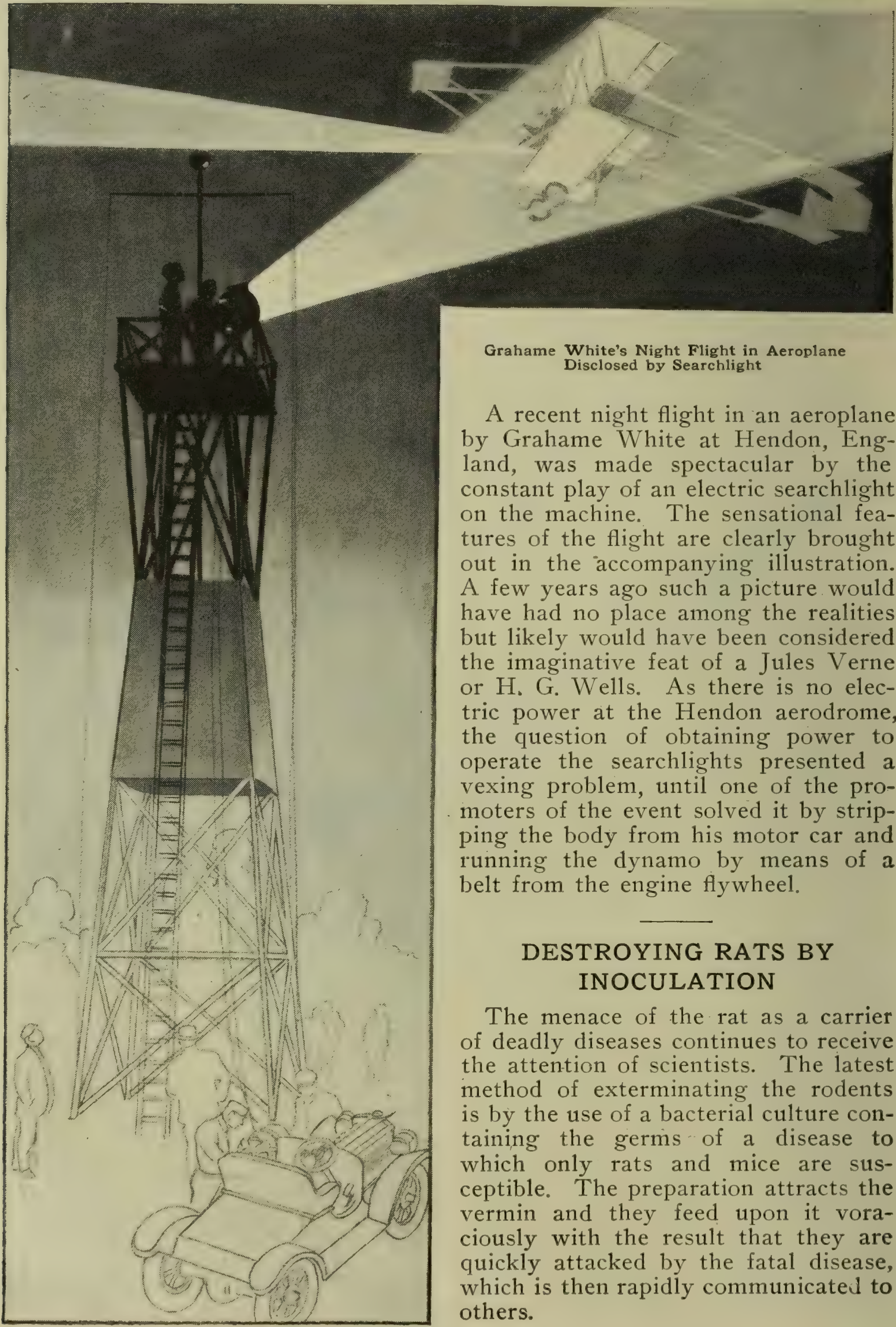
ELECTRIC BELLS WITHOUT BATTERIES

A batteryless electric doorbell, which was recently put on the market, makes use of a compactly designed magneto generator, which is operated through gearing from a small handle that replaces the ordinary push button.

The magneto generator is provided with an extension shaft, so that it can be installed on a door casing of any thickness, with only the handle, which has the appearance of an oblong door knob, and the escutcheon plate showing from the front. The generator itself may be mounted on the inside edge of the door jamb, it being very neat in appearance; or, if desired, it may be mortised in the brick or woodwork, the escutcheon plate being of ample size to cover the opening for it.

Wires are run from the generator to a bell, which may be located anywhere, with respect to the generator. The bell operates very easily, only a small part of a turn of the handle being required when it is desired to sound the signal.

MOTOR CAR FURNISHES POWER FOR PYLON BEAM



Grahame White's Night Flight in Aeroplane Disclosed by Searchlight

A recent night flight in an aeroplane by Grahame White at Hendon, England, was made spectacular by the constant play of an electric searchlight on the machine. The sensational features of the flight are clearly brought out in the accompanying illustration. A few years ago such a picture would have had no place among the realities but likely would have been considered the imaginative feat of a Jules Verne or H. G. Wells. As there is no electric power at the Hendon aerodrome, the question of obtaining power to operate the searchlights presented a vexing problem, until one of the promoters of the event solved it by stripping the body from his motor car and running the dynamo by means of a belt from the engine flywheel.

DESTROYING RATS BY INOCULATION

The menace of the rat as a carrier of deadly diseases continues to receive the attention of scientists. The latest method of exterminating the rodents is by the use of a bacterial culture containing the germs of a disease to which only rats and mice are susceptible. The preparation attracts the vermin and they feed upon it voraciously with the result that they are quickly attacked by the fatal disease, which is then rapidly communicated to others.

TRANSPLANTED RUBBER TREES THRIVE

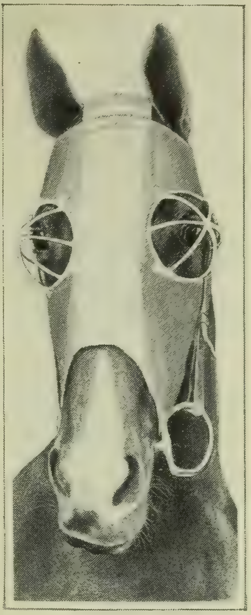
Experiments covering a number of years in transplanting rubber trees from the original stock seem now to have justified the efforts of the growers. The former supply came almost entirely from the district bordering the Amazon and its feeders but in recent years transplanting has been practiced on a rather large scale, the original stock having been taken from the old rubber districts and cultivated in portions of Brazil remote from the big river. One company, during the last year, gathered 193,750 lb. of rubber compared with 41,983 lb. in 1910. The estimate for the current year is 325,000 lb., all of which comes from the interior, far from the Amazon.

BRITISH OIL-FUEL LOCOMOTIVE

In the accompanying illustration is shown one of the great number of oil-burning locomotives at present in use on the Caledonian Railway, operating trains through England and Scotland. The oil is stored in a cylindrical tank carried on the tender where coal is ordinarily stored. The oil flows from the tank to the engine injectors which force it into the fire box at two separate points, where it mingles with steam from the boiler.

New Type of Oil-Fuel Locomotive, Adopted by One of the Great British Railroads, the Fuel being Kept in a Cylindrical Tank on the Tender

PROTECTS PONIES' EYES IN COAL MINE

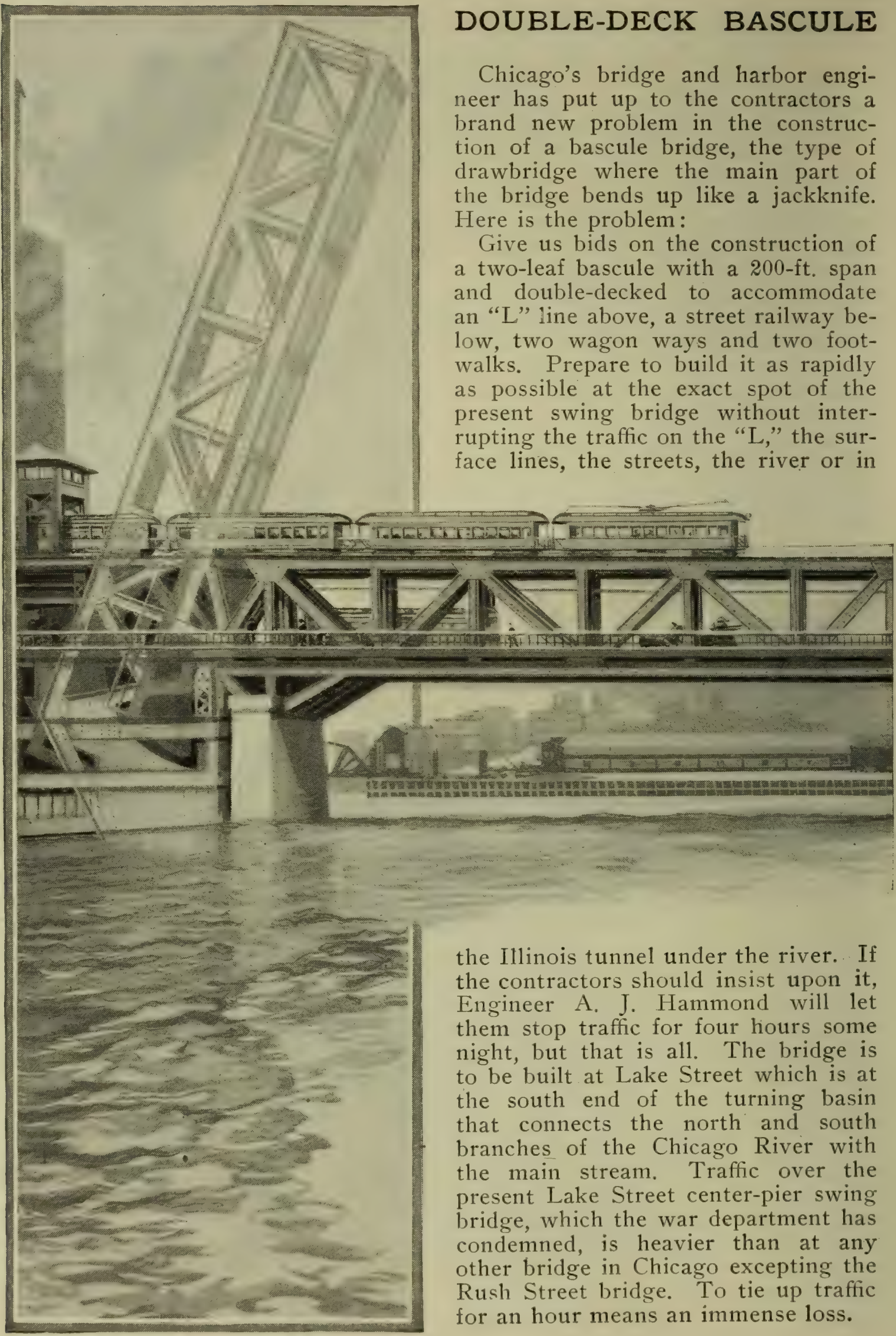


A new law in England has been enacted to enforce humane treatment of the "pit ponies"—as the horses are called that are employed in coal mines. The new law has inspired the invention of the eye guard shown in the accompanying illustration. Before the law went into effect, many ponies became blind through injuries caused by projecting coal seams and rocks that protruded into the subterranean passages of mines, all previous efforts to protect them having failed.

DOUBLE-DECK BASCULE

Chicago's bridge and harbor engineer has put up to the contractors a brand new problem in the construction of a bascule bridge, the type of drawbridge where the main part of the bridge bends up like a jackknife. Here is the problem:

Give us bids on the construction of a two-leaf bascule with a 200-ft. span and double-decked to accommodate an "L" line above, a street railway below, two wagon ways and two footwalks. Prepare to build it as rapidly as possible at the exact spot of the present swing bridge without interrupting the traffic on the "L," the surface lines, the streets, the river or in the Illinois tunnel under the river. If the contractors should insist upon it, Engineer A. J. Hammond will let them stop traffic for four hours some night, but that is all. The bridge is to be built at Lake Street which is at the south end of the turning basin that connects the north and south branches of the Chicago River with the main stream. Traffic over the present Lake Street center-pier swing bridge, which the war department has condemned, is heavier than at any other bridge in Chicago excepting the Rush Street bridge. To tie up traffic for an hour means an immense loss.

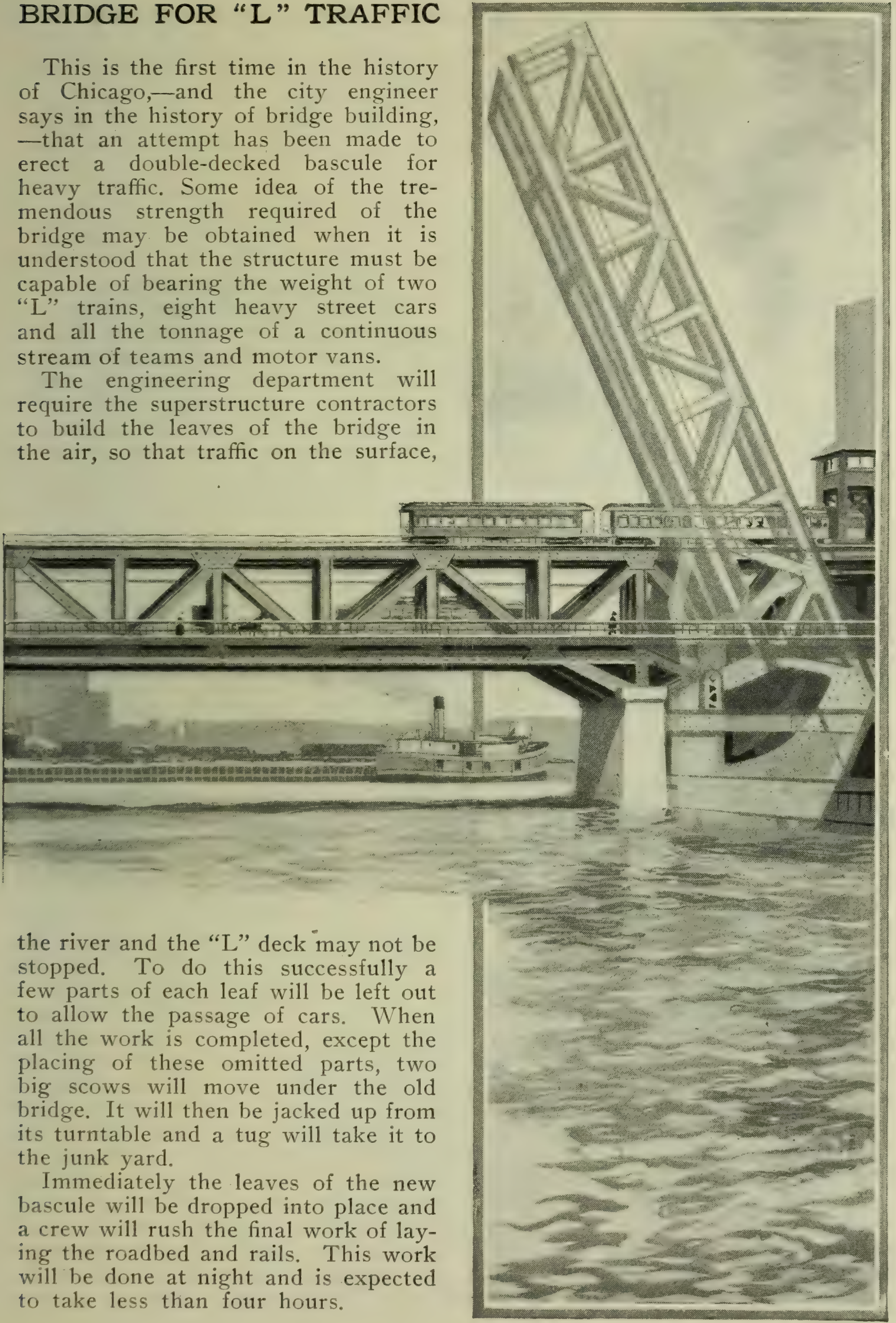


BRIDGE FOR "L" TRAFFIC

This is the first time in the history of Chicago,—and the city engineer says in the history of bridge building,—that an attempt has been made to erect a double-decked bascule for heavy traffic. Some idea of the tremendous strength required of the bridge may be obtained when it is understood that the structure must be capable of bearing the weight of two "L" trains, eight heavy street cars and all the tonnage of a continuous stream of teams and motor vans.

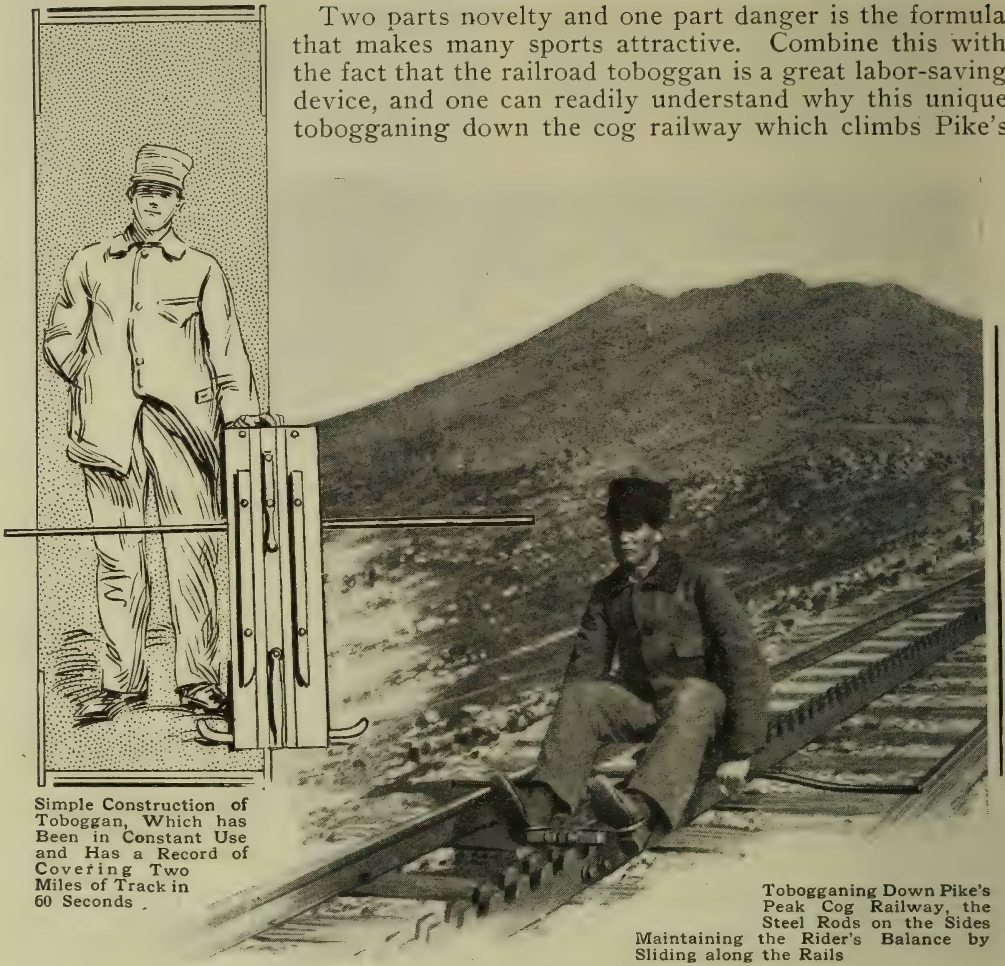
The engineering department will require the superstructure contractors to build the leaves of the bridge in the air, so that traffic on the surface, the river and the "L" deck may not be stopped. To do this successfully a few parts of each leaf will be left out to allow the passage of cars. When all the work is completed, except the placing of these omitted parts, two big scows will move under the old bridge. It will then be jacked up from its turntable and a tug will take it to the junk yard.

Immediately the leaves of the new bascule will be dropped into place and a crew will rush the final work of laying the roadbed and rails. This work will be done at night and is expected to take less than four hours.



RAILROAD TOBOGGANING ON PIKE'S PEAK

Two parts novelty and one part danger is the formula that makes many sports attractive. Combine this with the fact that the railroad toboggan is a great labor-saving device, and one can readily understand why this unique tobogganing down the cog railway which climbs Pike's Peak, Colorado, is so fascinating. To make a drop of nearly a mile and a half in a distance of nine miles of track, sometimes at a speed of two miles a minute, is the reason why the railway toboggan has come into use, for the employes find it far more exhilarating to slide down the mountain than to go on foot. When a tired and hungry workman quits work at the summit at six o'clock and is due at the Saddle House, two and a fourth miles below, for supper, he usually prefers to "slide down the banister" rather than to "go down the stairs" from tie to tie in his descent. This practice has been responsible for several deaths and many serious injuries, yet it continues, although the authorities have attempted to discourage its use.



Simple Construction of Toboggan, Which has Been in Constant Use and Has a Record of Covering Two Miles of Track in 60 Seconds

Tobogganing Down Pike's Peak Cog Railway, the Steel Rods on the Sides Maintaining the Rider's Balance by Sliding along the Rails

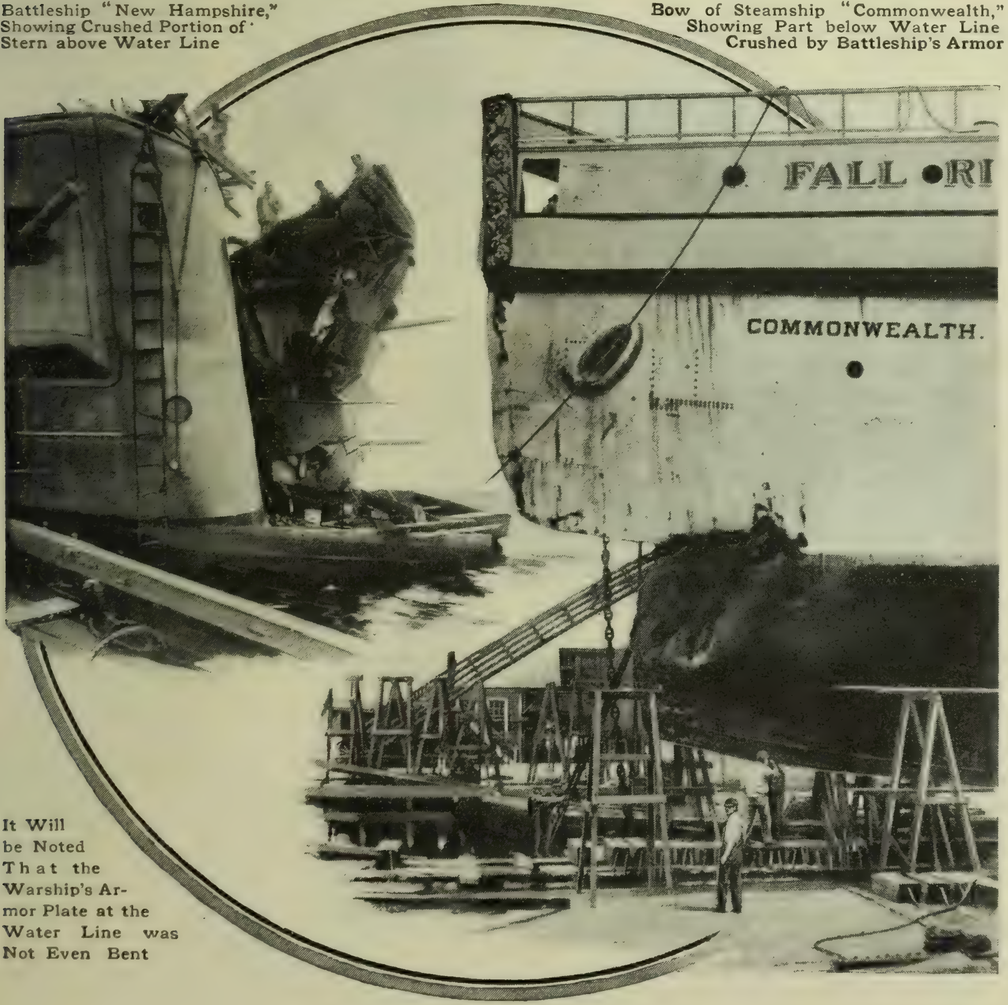
In riding the toboggan the operator sits upright, much as a boy would in guiding a bobsled, but there is no guiding to be done, for the machine is made to follow the tops of the cog rails. The toboggan itself is a board 3 ft. long and 1 ft. wide. A steel-shod cleat, about 1½ in. wide, runs in the center of the under side for its entire length. When the machine is in place on the cogs this cleat fits in between the cog rails, which are parallel with each other and close together, midway between the main rails of the track. Near each edge of the board is another cleat, about 18 in. long, also shod with iron, and movable. These form the brakes and are operated by a powerful lever from the upper side of the board, the pressure applied in this manner on the sides of the cog rails being sufficient to bring the toboggan to a stop on the steepest grade.

The Pike's Peak toboggans have established a record of an 11-minute run over the nine miles from the summit of the mountain to Manitou at its foot. A two-mile stretch on the steepest part of the grade has been made in one minute.

WARSHIP'S ARMOR PLATE STANDS COLLISION

The accompanying photographs show the unique results of the collision between the United States battleship "New Hampshire" and the Fall River steamship "Commonwealth," at Newport, R. I., in July. The conclusion drawn from these pictures which most interests naval constructors is that the armor belt of the battleships can withstand the most severe impacts.

The "New Hampshire" was lying at anchor in Newport harbor when the collision occurred. There was a dense



Battleship "New Hampshire," Showing Crushed Portion of Stern above Water Line

Bow of Steamship "Commonwealth," Showing Part below Water Line Crushed by Battleship's Armor

It Will be Noted That the Warship's Armor Plate at the Water Line was Not Even Bent fog, and before the lookouts on either ship discovered the proximity of the other, it was too late to avoid the crash. The passenger steamship plunged, bow on, into the stern of the "New Hampshire" almost on the center line of the ship.

When the vessels separated after the crash, apparently the "Commonwealth" had sustained no damage, while it was seen that the stern of the "New Hampshire" was almost demolished above the water line. The bow of the "Commonwealth" penetrated the stern of the battleship a distance of about 20 ft. The steel plating was folded in, decks torn up, and the captain's cabin was demolished.

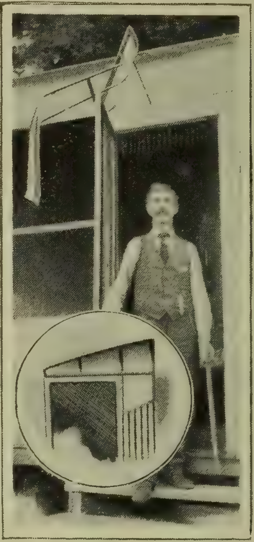
Comparison of the effects of the collision upon the two ships, so far as the damage done to both was visible as they lay in the water, resulted at first in the severest criticism of the battleship's construction. Amazement was expressed that the prow of a passenger steamer, even though she be a steel ship, could so crush the stern of a battleship, supposedly built to withstand heavy shell fire.

Further examination of the two ships, however, turned the tables. It was found that the damage to the "New Hampshire" ended at the armor belt, two or three inches above the water line. Not a single plate of the armor was broken or displaced. The more vital portions of the ship's structure, then, remained intact. Only the upper works, the thin sheathing, which is designed merely to finish off the stern of the battleship and withstand the sea, was injured, and the damage, while it looked so serious, was in reality rather superficial. Not even the watertight bulkhead was broken through, so that the damage was confined to the sternmost compartment.

When the "Commonwealth" was docked, however, it was discovered that the portion of the bow, below the water line, which had struck the armor belt of the "New Hampshire," was fearfully mangled. The steamer was thus rendered unseaworthy to a much greater extent than was the "New Hampshire."

"SHOO FLY" GUARD TO HELP SCREEN DOORS

An interesting device designed to keep the flies from entering the house or store when the screen is opened to let people in and out is here shown.



Attached to the top of the door and extending a foot or two down its outer side is a screen attached to metal supports which are bent or curved outward. To the bottom of a portion of this screen are attached a number of cloth bands. One of the illustrations shows the guard in the position it occupies when the door is closed. When the door is pushed or pulled open the top of the guard screen is restrained sufficiently by a checking attachment to make the lower end, with its tasseled strip of cloth, swing outward about 2 ft. in advance of the door, thus dispersing the flies that might otherwise enter. The screen portion of the guard above the door is calculated to keep flies from entering over the door.

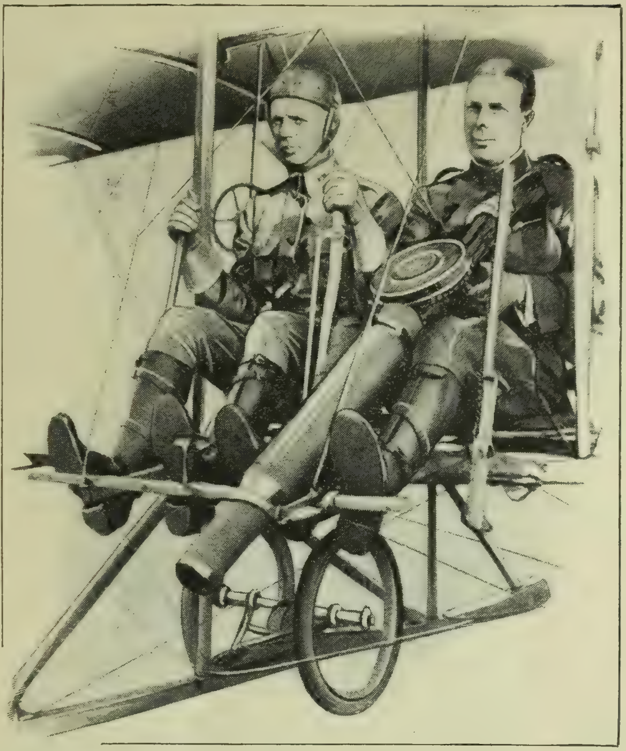
CATCHING GRASSHOPPERS IN VACUUM CLEANER

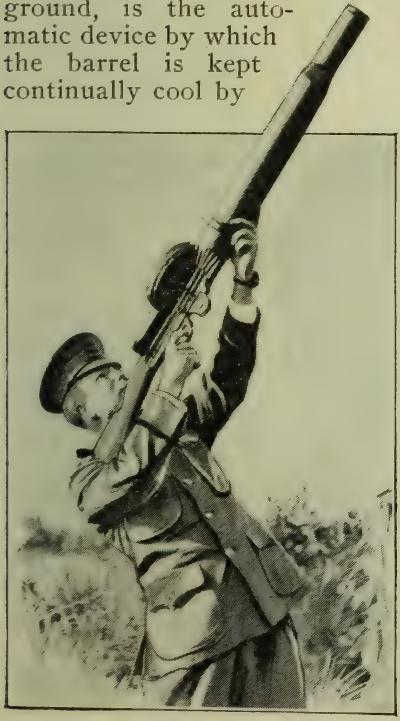
Catching grasshoppers with a vacuum cleaner is an idea worked out successfully by a California man. He found that grasshoppers from the alfalfa were a serious pest in the house gardens, so he rigged up a sled for the vacuum cleaner, and proceeded to capture the insects from the fields. The hoppers jumped as the sled approached, but were then sucked up by the cleaner.

RAPID-FIRE GUNS FOR AEROPLANES

No branch of the science of aviation is receiving closer study in army circles than that tending to the development of armaments for aeroplanes. New ideas in rapid-fire guns, or adaptations of the old, are being experimented with by the military experts of all the great powers; and of the guns now creating interest an American gun is one of the most important.

The gun in question is a new type of automatic, invented by Lieut.-Col. I. N. Lewis, of the coast artillery corps, who has designed many useful military implements. One of the important features of this gun, which may be held to the shoulder like an ordinary rifle when being used to attack aerial fighters from the ground, is the automatic device by which the barrel is kept continually cool by a blast of air. After a certain temperature is reached, an increased rapidity of fire tends to reduce the temperature. Another distinguishing feature is the circular magazine feed, which is placed directly over the center of the gun, and consequently does not disturb the aim.





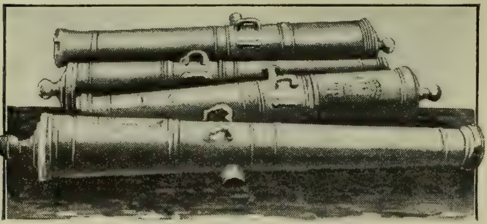
New Rapid-Fire Gun Tested by Army Aviation Corps for the Two Uses of Firing at Aeroplanes from the Ground and Firing from Aeroplanes

The weight of the gun is but slightly more than 25 lb.; it fires 250 shots per minute, and the magazine, which contains 50 rounds of ammunition, can be quickly detached to allow the substitution of a loaded magazine. The feed is positive, and the gun may be fired at any angle, up or down.

During one of the experiments made by Captain Chandler, the empty shells ejected during the firing were caught by a current of wind that carried them into the propellers. When the machine came down, the wooden propellers were found to have been scored or gouged as if a vandal had attacked them with a chisel.

The French have adapted a Hotchkiss rapid-fire rifle for attachment to the under framework of an aeroplane where it may be trained on the enemy below.

ANCIENT BRONZE GUNS USED IN ENGINE MANUFACTURE



Ancient Bronze Cannon Bought Up to Provide Bronze for Diesel Engines

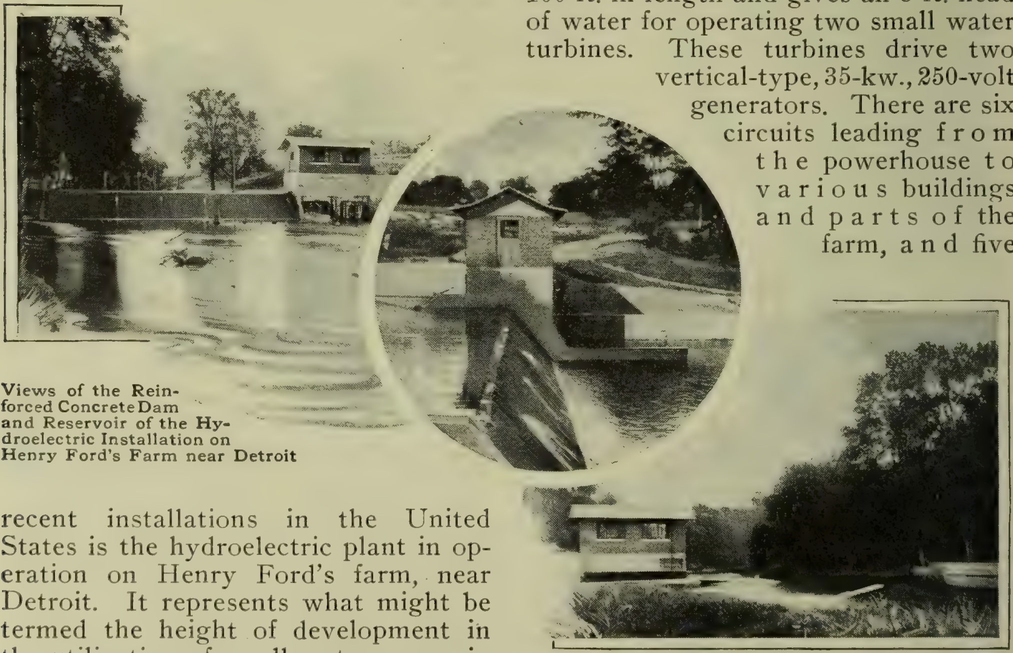
One of the interesting things that a writer in the Engineer, London, found in the course of a visit to the Diesel engine plant in Turin, Italy, was a collection of ancient bronze cannon which had been bought up to be melted and converted into crank casings and bedplates. One of the guns seen was a beautiful piece of work, dated 1717, and had the name of King Philip V of Spain on the breech. It was worthy, the writer believes, of a better fate.

"LOOK-OUT-FOR-THE-CAR" SANITARY CUPS

The necessity of providing its passengers with sanitary drinking cups has been utilized by the Beaver Valley Traction Company of New Brighton, Pa., as a means of impressing them with accident-preventing "don'ts."

On the sides of the paper sanitary drinking cups is printed such advice as "Stop—Look—Listen," "Look out for automobiles and cars from opposite direction," "Never step on or off a car while in motion," "Don't allow children to play in streets on which electric cars run."

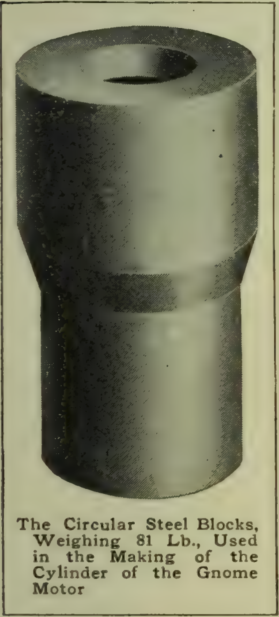
HYDROELECTRIC POWER ON A FARM



Views of the Reinforced Concrete Dam and Reservoir of the Hydroelectric Installation on Henry Ford's Farm near Detroit

Electricity is becoming more and more a desirable prime mover on the farm, and one of the most interesting recent installations in the United States is the hydroelectric plant in operation on Henry Ford's farm, near Detroit. It represents what might be termed the height of development in the utilization of small water power in the operation of a private plant, the power being provided by the damming of a small stream running through the farm.

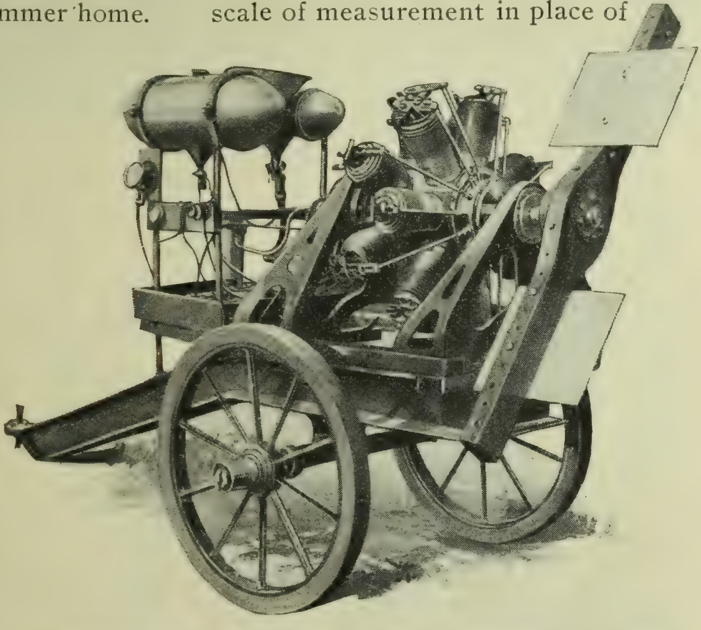
The reinforced concrete dam is about 100 ft. in length and gives an 8-ft. head of water for operating two small water turbines. These turbines drive two vertical-type, 35-kw., 250-volt generators. There are six circuits leading from the powerhouse to various buildings and parts of the farm, and five of these circuits are laid underground. The longest circuit is 2½ miles, and operates the machinery of the dairy farm. The house and barns are all electrically lighted, there being 60 incandescent lamps in the barns and 14 in the house. Another circuit is a mile long, and operates the machinery of the stock farm as well as illuminating the cattle and horse barns. The other lines operate the machinery in the repair house, the pump house, etc., and illuminate and provide power for numerous cooking, heating and household utensils in Mr. Ford's summer home.



The Circular Steel Blocks, Weighing 81 Lb., Used in the Making of the Cylinder of the Gnome Motor

THE MAKING OF GNOME MOTORS

The Gnome motor with its revolving cylinders, is probably the most famous and most universally used of all aeroplane motors, particularly in Europe. In one of the illustrations may be seen one of the circular steel blocks used in the making of the cylinders. They are of nickel steel, and weigh 81 lb. each. In the boring and the finishing, these cylinders are reduced in weight from 81 lb. to only 6.16 lb. The interiors of the cylinders are polished by high-speed emery wheels until they are as smooth as the surface of a mirror.



A Finished Motor Mounted on the Test Car Preparatory to a Long-Duration Run

A MEASURING DEVICE FOR X-RAYS

A scientist of Berne recently demonstrated before the Röntgen Congress in Berlin an instrument for measuring the action of the X-ray on deep-seated organs. The device gives direct readings of the intensity of the rays at the depth required, and can be used with any type of X-ray installation.

The introduction of an absolute scale of measurement in place of the arbitrary scales used in different X-ray laboratories is said to be a great boon, as it makes it possible to calculate the most efficient irradiation, and determine the correct dose for treating subcutaneous organs. It is claimed that this has hitherto only been possible when surface tissues have been treated.

ℭDuring the first five months of the present year there were 85,300 motor vehicles registered in the state of New York, of which number 76,164 are pleasure cars and 7,320 commercial vehicles, the remainder being dealers' cars, or exempt from taxation.

An Exceptionally Light and Graceful Bridge Crossing the River Vilaine, France

SANDSTONE KNOB AS BANDSTAND FOUNDATION

A novel use has been found for one of the water and weather-worn sandstone formations so common along the shores of the upper peninsula of Michigan. The knob in question is located at St. Ignace, and on its top the band organization of that upper peninsula town has erected a bandstand. The stand commands a fine view of the straits and Mackinac Island.

A Bandstand on the Top of a Sandstone Knob at St. Ignace, on the Straits of Mackinac, Michigan

AN ARTISTIC FRENCH HIGHWAY BRIDGE

The national highways of France are kept as fine as the best examples of city boulevards in America, and the bridges are usually in keeping with the roads. The new bridge across the River Vilaine, on the highway connecting the cities of Nantes and Brest, Brittany, is an excellent example, being extremely light and graceful in appearance.

The length of the bridge proper is 656 ft., the free span being reduced by the cantilever arches to about 367 ft. The height of the roadway above the river, at normal level, is 114 ft.

U. S. GOVERNMENT LARGEST DREDGING CONCERN

Attention is drawn by the Engineering News to the fact that the United States government is the largest dredging concern in the world, having a vast dredging fleet engaged in river and harbor improvement work. The fleet consists of 61 bucket and dipper dredges, 53 hydraulic pipe-line dredges, 23 seagoing hopper dredges, 60 snag boats, 164 screw-propeller and paddle-wheel boats for towing and survey work, 54 derrick boats, 49 pile drivers, and numerous other boats which bring the total up to 855 vessels.

MOTION-PICTURE RECORDS OF RECLAMATION WORK

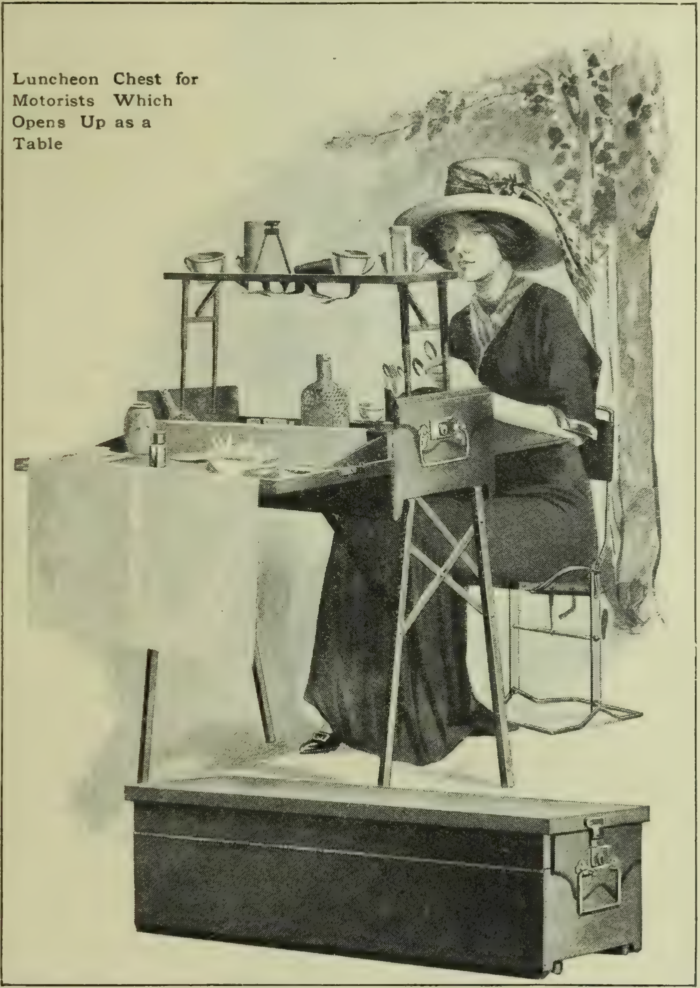
As part of the movement to give publicity through motion pictures to all important works carried on by the government, a series of pictures have been recently made of the work on the Engle Dam, at Elephant Butte, New Mexico, which is part of the Rio Grande reclamation project.

Of all the motion pictures taken, probably the most interesting are the series photographed from a basket suspended from a cableway across the Rio Grande. The operator, with his camera in operation, was lowered into the foundation pit at the west bank of the river, and then, with the basket raised 400 ft. above the bottom of the pit, took pictures while three heavy blasts were fired. The basket was then moved over the river and lowered almost to the surface of the water, during which descent, the camera was turned through a complete circle so that the views would take in the entire work. The pictures will be exhibited generally in America and Europe.

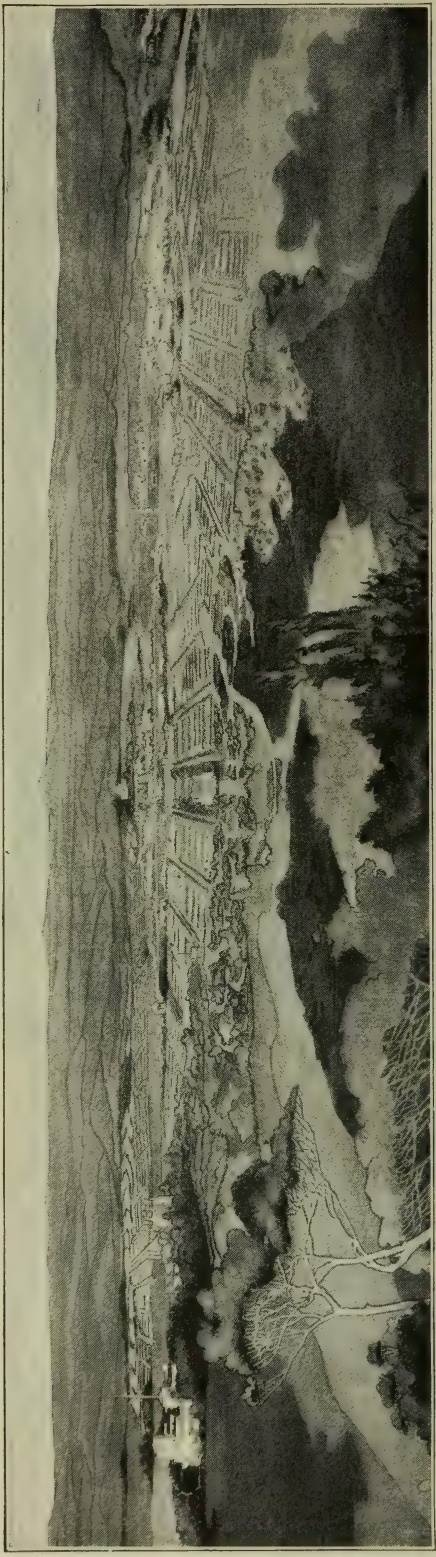
ℭThe Post Office Department is conducting a series of experiments in various parts of the country to determine whether or not the motorcycle can be used more economically for collecting mail than either the horse-drawn vehicle or the automobile.

COMPACT LUNCHEON SET FOR MOTORISTS

One of the most elaborate luncheon sets for motorists now on the market is the so-called motor restaurant, a complete outfit which packs compactly in the form of a chest for transportation in the car. The outfit costs $125 or $150, depending upon whether it is fitted for four or six persons. When the spot for the luncheon is reached, the chest is taken from the car, opened up and made into a table, as shown in the illustration. Across the top in the center is a rack, on which glasses, cups, etc., may be placed within easy reach of the users.



Luncheon Chest for Motorists Which Opens Up as a Table



Australia's New Capital City from Mount Ainslie, the Capitol Building being in the Center

CREATING A CAPITAL

In a picturesque mountain valley 2,000 ft. above sea level and now practically a wilderness, a new capital city for the Commonwealth of Australia is to be created. As the result of a competition in which more than a hundred of the leading architects and landscape gardeners of the world competed, this city is to be built in accordance with the plans of an American architect, Walter Burley Griffin, of Chicago, who was awarded a prize of £1,750, equivalent to about $8,500. The site of the new city is midway between Melbourne and Sydney and 75 miles from the sea coast, and work is to begin immediately.

The plan embodies the most advanced theories in city planning. The different functions of the city are grouped at specific centers, each arranged roughly in the form of an octagon, with main avenues radiating in all directions. Such a theory has never before been worked out in complete form, although Haussmann applied it in a limited way in the rebuilding of Paris, and L'Enfant, in his plan of Washington, provided diagonal avenues intersecting a checkerboard system of streets.

The practice of walking from point to point is rapidly becoming obsolete with city dwellers and there is an increasing tendency to use means of rapid transit. For this reason the different centers in the Australian capital have been placed at considerable distances apart. In a capital city the federal center is the one of first importance. This center comprises the octagon and triangular group of buildings south of the central lagoon. At the center of the octagon, occupying a prominent elevation, are the federal executive buildings. On the sloping ground extending to the lagoon, and arranged in terraces, are the parliament and department buildings, and courts of justice. On the opposite side of the lagoon are the stadium, museum, theaters, and other places of amusement.

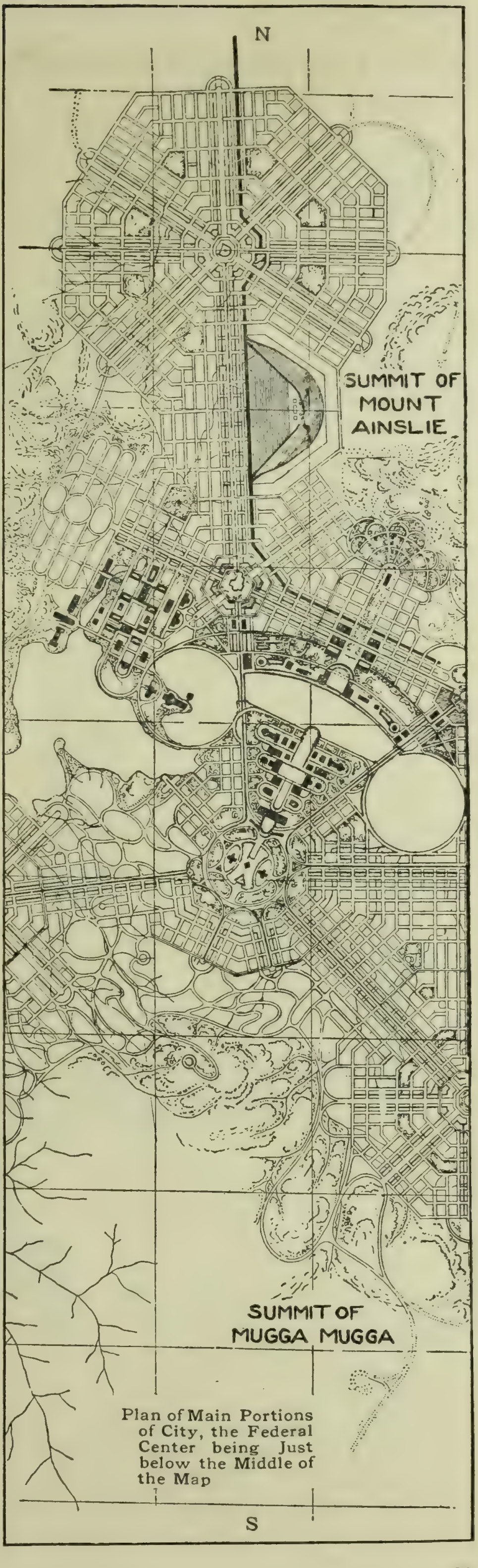
North of the federal center, and across the lagoon from it, is the mu-

CITY FOR AUSTRALIA

nicipal center, the one next in importance. At the center occupying the third angle of this triangle are located the central railway station and retail market. The manufacturing district lies at the northern edge of the city, and the agricultural suburb, consisting of several centers, at the southeast. The principal residence district is west of the federal center, on high ground affording an unobstructed view of the mountain range to the southwest. The federal university is located to the west of the municipal center on the slope of a mountain.

Main avenues are planned for a width of 200 ft., divided by parkways into three arteries of travel: one for street cars, one for automobiles, and the third for slower vehicles. The steam railway is to be depressed below street level with street crossings carried on viaducts.

A striking feature of the plan is the advantage taken of the natural conditions of the site. A small stream known as the Molonglo River is used in the development of a series of lagoons that form the central feature in the general architectural effect. Prominent elevations, of which there are a number, will be utilized as sites for public and monumental buildings. Mountain peaks will close the vista of each important avenue, while Mount Bimberi, one of the highest peaks of the Australian range, will be visible from all parts of the city.



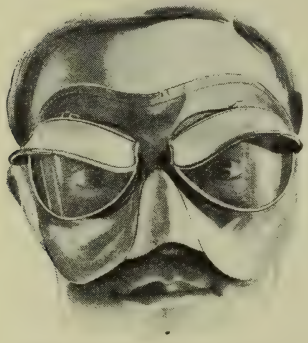
Plan of Main Portions of City, the Federal Center being Just below the Middle of the Map

PLAYER PIANO USED WITH LONDON ORCHESTRA

A recent concert of the famous London Orchestra, conducted by Nikisch, was unique in that it was the first time, in England at least, that a mechanically played piano was used as part of a great symphony orchestra. The pianoforte part of Grieg's Concerto in A Minor and in Liszt's Hungarian Fantasia is said to have been performed by the player piano with perfect effect.

NEW AUTOMOBILE CAP AND GOGGLES

Among recent importations of wearing apparel for motorists are the goggles and cap shown in the accompanying illustrations. The cap is adjustable to heads of different sizes by means of the cloth strap which passes around its rim and is provided with a buckle. The goggles have awning-like eye shades which can be folded back when not needed.



Goggles with Adjustable Awning-Like Eye Shades

A Cap Which may be Adjusted to Fit Any Head

SUBMARINE IMPRISONED AT GREAT DEPTH

Contrary to general practice in testing submarines at great depths, the new U. S. submarine "Carp" was recently sunk to a depth of 200 ft. at San Francisco with a crew of eight men on board, and an accident which might have ended disastrously kept the little vessel at the bottom for over an hour. The trouble was due to fouling of the hawser pipe of the submarine by an anchor chain, which for a time prevented a return to the surface. During the time the submarine was thus caught telephone communication was maintained with the officers in charge of the test at the surface.

The service of the crew was voluntary, and a considerable bonus was offered.

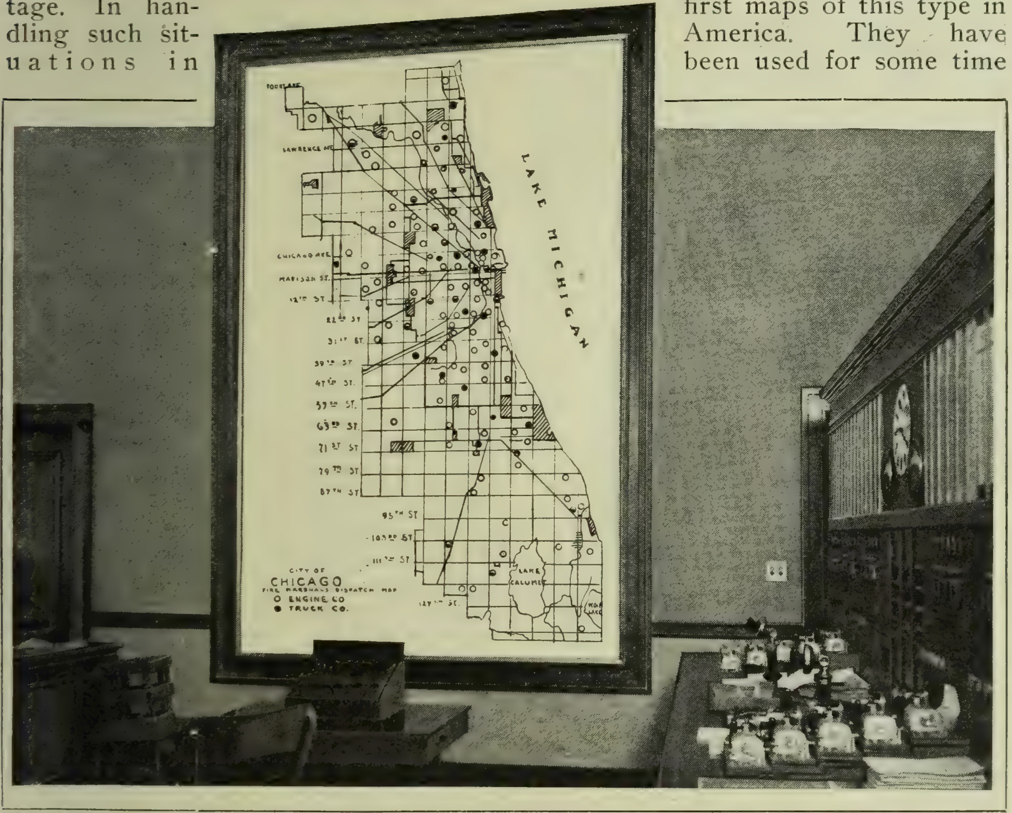
NEW IDEA IN EXTENSION TABLES

A dining-room table which is, in appearance, like an ordinary extension table, but which may be extended without the use of any loose leaves, has made its appearance in the furniture world. The center or extension section is concealed under the top of the table, when this is closed up, and in order to make this possible has hinged portions at its shorter ends, which normally hang down. When extending the table, its end sections are drawn apart and the center section by means of a lever raised about 1¼ in. to the level of the top. The hinged portions at each side are then raised so as to make the center section the full width of the table, and the sections are forced together, the dowels entering the holes and locking as in other extension tables. When the table is to be shortened, the end sections are pulled out two or three inches, the center section lowered the required 1¼ in., and the hinged side portions dropped. Then the end sections are pushed together over the center section. No hint of its unusual mechanism is seen in the closed table.

Extension Dining Table, the Central Portion of Which, Operated by a Lever, Can be Lowered so That the End Sections Slide Together over It

FIRE-STATION MAP SHOWS UNPROTECTED TERRITORY

When a big fire occurs in any section of a large city, all the fire apparatus in that section, and often from adjacent sections, are called into service, and frequently this causes considerable difficulty in distributing the remaining companies and apparatus to the best advantage. In handling such situations in Chicago, the fire-alarm headquarters in the city hall is provided with a map of the city on which each fire house is designated by a small electric-light bulb, operated by a switchboard. These bulbs are illuminated during the time the apparatus of each fire station is in its house, but as soon as the apparatus leaves its house, a plug bearing the number of the station in question is removed from the switchboard and the bulb designating this station on the map becomes dark.



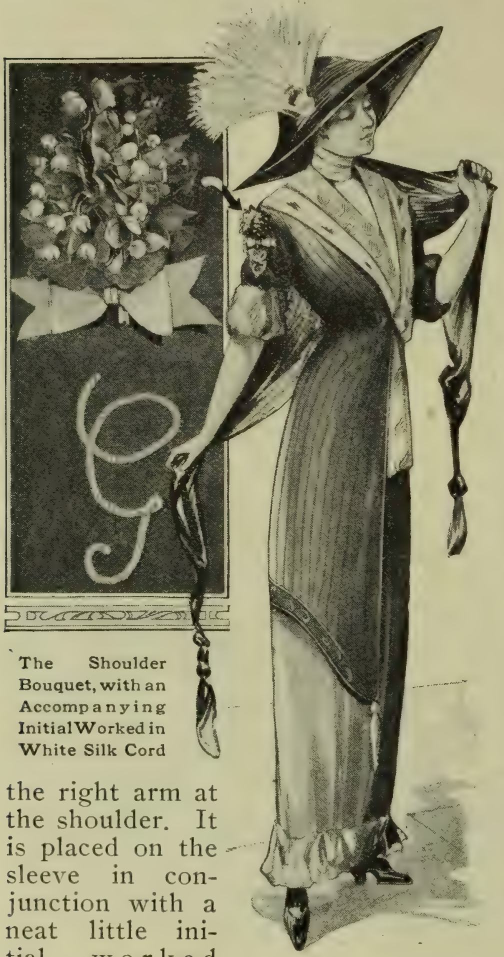
The Illuminated Fire-Station Map in the Fire-Alarm Headquarters of the Chicago Fire Department

By means of this system, a glance at the map suffices to show the unprotected territory, and the fire apparatus not in actual use are distributed accordingly. The illustration shows the map in the position it occupies on the wall of the fire-alarm headquarters. This is one of the first maps of this type in America. They have been used for some time in Germany. Milwaukee has a fire map of a somewhat similar type.

ℭAn American sailing vessel, the "Erskine M. Phelps," made a voyage from Honolulu to Philadelphia in 110 days, and she has to her credit also a voyage from Norfolk to Honolulu in 97 days, the fastest time ever made around Cape Horn by a sailing ship. Her latest voyage is the fastest time ever made by a sailing ship on the eastern voyage.

NEWEST WAY OF WEARING A BOUQUET

One of the latest fads in flower adornment is to wear the bouquet on the right arm at the shoulder. It is placed on the sleeve in conjunction with a neat little initial worked with white silk cord. The effect is most pleasing, and, to the girl endowed with artistic fingers, many pretty arrangements or variations will suggest themselves.



The Shoulder Bouquet, with an Accompanying Initial Worked in White Silk Cord

ARTIST AND SCIENTIST TRY NIGHT PAINTING

How to obtain satisfactory light for portrait painting at night is being studied scientifically by a young Chicago artist, Mosheim Craig, with the advice and assistance of one of the leading scientists of the country. The scientist became interested in painting, using Mr. Craig's studio, and as he had little time for this avocation except evenings, the problem of illumination was forced on him. The two have worked together for a solution, to some extent covering the same experimentation ground as the investigators who have been seeking artificial daylight for use in stores.

The artist claims that there is a certain æsthetic value to painting done at night. But when he tried to mix oil paints by artificial light, he found that the color values were lost and that the work when viewed the next morning was practically worthless. The youthful collaborator with the scientist sought a light which would "take the yellow" out of the rays from a tungsten cluster. The first effort was very nearly a success. A large tank was built. A 500-watt tungsten lamp was placed in the rear of it. The reflectors threw this light forward through two pieces of plate glass. The secret of the light lay in the substance between these pieces of glass. It was clear water tinged to a violet color with an aniline dye. This accomplished the purpose of producing the colors of daylight. But the experiment failed for one very simple reason; after the light had sifted through the colored water it was too weak to reach the painter's easel and his palette.

For a time Craig tried to produce the same result by wearing automobile goggles of blue glass. He sought a violet-tinted glass, but no optician could supply it. With the blue glasses he painted two portraits, one of Judge Kenesaw Mountain Landis, but when he exposed these to daylight he found that they were "too gray." The colors lacked brilliancy.

The scientist has now suggested that the problem can be solved by securing from Germany a certain violet-tinted gelatine film, colored under the artist's personal direction. This will be placed in the light box in lieu of the water tank and the tinted water—which, by the way, had a habit of steaming. Both experimenters believe they will then have found the answer to their riddle. Should this also fail, they have other plans which are not being discussed at this time.

The experiments have already proved of value in a mechanical way. The light blue glasses for example gave a sufficiently accurate color value for matching of cloths and for the use of decorators who work at night under the ordinary incandescent lamp. If such a glass is used on the stage or in a department store over a brilliant yellow lamp the result to the ordinary observer is artificial daylight. The woman who bought a costly delicately tinted gown under such conditions, however, might be disappointed when she looked at it in daylight.

ARTIFICIAL SILK MADE FROM VEGETABLE

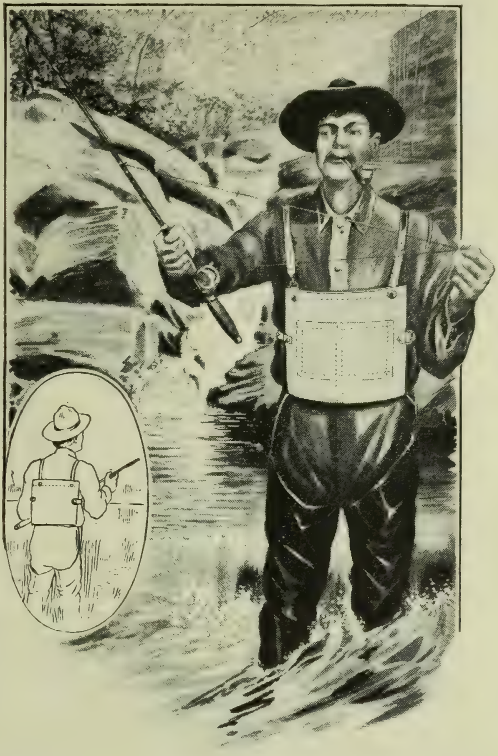
In Muskegon, Mich., is a knitting mill which manufactures artificial silk out of vegetable fiber, and uses it to make hosiery and underwear. The artificial product is soft and silky like worm silk, but is claimed to have more body or firmness.

The underwear and hosiery are made in all weights from gauze to winter wear. The vegetable silk fiber is brought to the knitting room on large reels, ready to be put on the electrically operated machines when needed.

The basis of most artificial silk is wood pulp. Cotton has proved satisfactory for the purpose, however, although the cost has been a serious drawback. The vegetable silk is the latest innovation. Any substance susceptible of chemical conversion into cellulose is available.

POUCH ARRANGEMENT FOR ANGLERS AND HUNTERS

A Missouri sporting goods concern is marketing a high and dry pouch and harness for anglers and hunters. It consists of two large pouches, one in front and the other in back, strapped over the shoulders and around the chest. On the outer surface of the front pouch are two small pockets for carrying small fishing or hunting accessories, such as flybooks, and the like. The position of the pouches is well above the waist line, so that they remain dry even during deep wading.



Pouch for Anglers and Hunters Arranged for Carrying Tackle and Ammunition Well above Water

RUSSIA TO SPEND VAST SUM ON NAVY

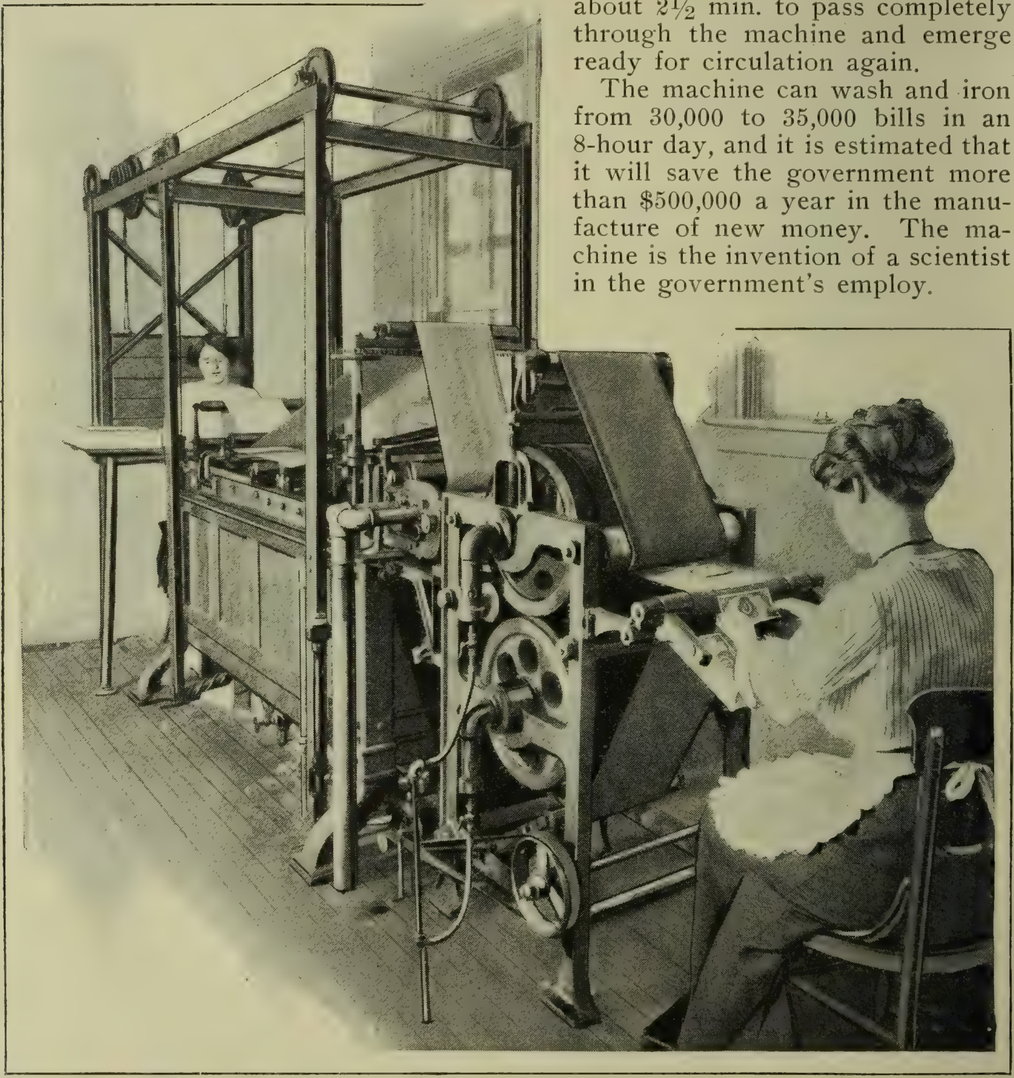
The Russian Duma has voted the enormous sum of $619,200,000 to be used during the next five years to restore the naval position of that country. About $57,960,000 is to be spent in construction in 1913, $48,000,000 per year for the years 1914-15-16, and $43,200,000 in 1917. In addition to this, the Minister of Marine requires $374,000,000 for the completion of ships now building and for current expenses.

U. S. TREASURY INSTALLS NEW MONEY LAUNDRY

After experiments covering a period of three years the Treasury Department has set up a money laundry that will wash and iron old bills, making them almost as good as new. It is estimated that about 60 per cent of the bills sent to the department can be saved by this machine, the 40 per cent remaining being so worn that the treatment would destroy them.

The bills, fed to the machine by a young woman operator, are carried between two 10-in. tapes into a tank of boiling water, and then through a solution which, when heated to the boiling point, forms peroxide of hydrogen. This destroys the germs that may have collected on the bills while in circulation. The bills pass from the disinfecting tank to a rinsing tank, and thence to a pair of large gas-heated cylinders, the passage between which smoothes out all wrinkles. The bills require about 2½ min. to pass completely through the machine and emerge ready for circulation again.

The machine can wash and iron from 30,000 to 35,000 bills in an 8-hour day, and it is estimated that it will save the government more than $500,000 a year in the manufacture of new money. The machine is the invention of a scientist in the government's employ.



The U. S. Treasury's Money Laundry in Operation. The Endless Band may be Raised to Top of Frame to Permit Examination of Money Passing Through

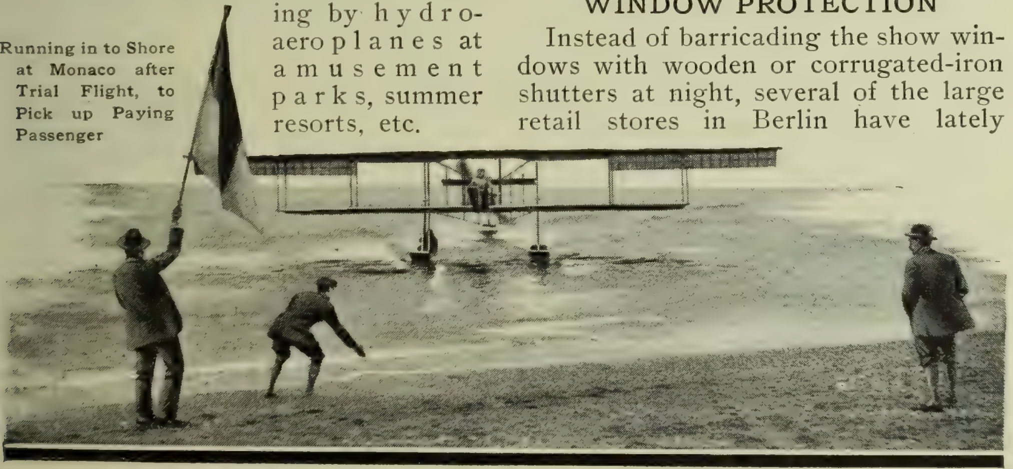
Hydro-Aeroplane at Monaco Carrying a Paying Passenger Who Desired to Enjoy Aeroplane Flight without Much Danger

THE HYDRO-AEROPLANE FOR PASSENGER CARRYING

The recent hydro-aeroplane competition at Monaco, while it did not bring forth anything especially novel in the way of new constructions, and resulted in no important records, was very interesting because of the large number of passengers carried by the different machines without a single accident.

In fact, so absolutely reliable did the combined air and water vehicle prove itself on this occasion, that it seems certain that a most profitable application of flight engineering in the very near future may be passenger carrying by hydroaeroplanes at amusement parks, summer resorts, etc.

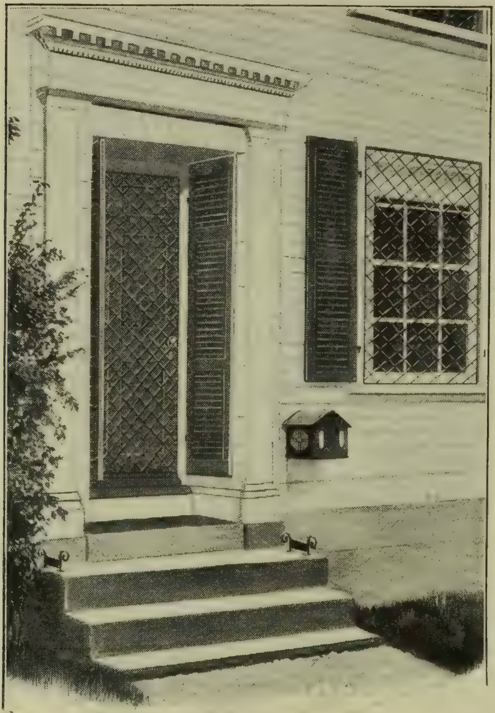
Water surfaces being comparatively soft and safe to alight upon, and so level and unobstructed that there is no occasion for attempting flight over them at any considerable height, the possibility of a serious accident with a well-built and competently piloted machine, and with the passengers perhaps protected by life preservers, seems so remote as to scarcely demand consideration by even the most timid.



Running in to Shore at Monaco after Trial Flight, to Pick up Paying Passenger

FLEXIBLE WIRE SCREEN AS WINDOW PROTECTION

Instead of barricading the show windows with wooden or corrugated-iron shutters at night, several of the large retail stores in Berlin have lately adopted a flexible large-mesh screen made of 0.4 to 0.6-in. iron wire, which, while affording an effective burglar protection, permits the window displays to be viewed. The screen shutters are raised, lowered, and locked in place from the inside.



Flexible Wire Screen Placed Inside Window and Door Casings, so as to Obtain Protection while Windows and Doors are Open

The same type of screen shutter is also claimed to have many advantages which make it desirable for use on country houses in more or less lonely districts. By its use, windows and doors may be barricaded against intrusion and still remain open to allow the entrance of fresh air.

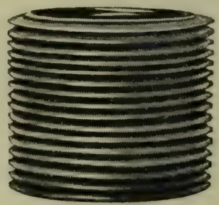
DISTINCTIVE COLORING FOR INDUSTRIAL-PLANT PIPES

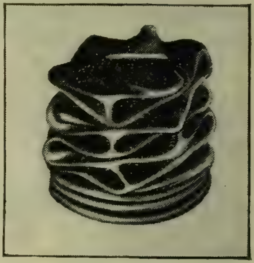
It is proposed in Germany to develop a uniform system of distinctive coloring for the piping in industrial plants, and the idea is being received with favor. According to the system, the pipes carrying water would be painted green; the gas pipes, yellow; air pipes, blue; steam pipes, white; oil pipes, brown; pipes carrying tar mixtures, black, and pipes carrying acids would be distinguished by being painted rose with red stripes.

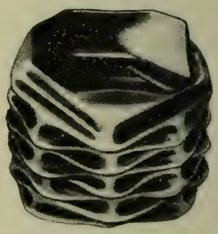
A fuller indication of the contents of the pipes, indicating dangerous pressures, temperatures, impurities, etc., may be effected by a combination of the basic colors, such for instance as stripes of red for danger, black for impurity, white for presence of steam, or some such manner.

BEHAVIOR OF METAL TUBES UNDER COMPRESSION

The behavior of metal tubes under compression has been the subject of interesting experiments by a French scientist, who has made tests with metal cylinders as tiny as 0.023 in. in diameter, 0.027 in. high and with walls only 0.00004 in. thick. These little tubes were submitted to compression in a hydraulic press, the piston of which moved at a constant slow rate of speed. The gradual changes in the shape of the tubes were photographed by a motion-picture camera. The illustrations here shown are greaty enlarged.

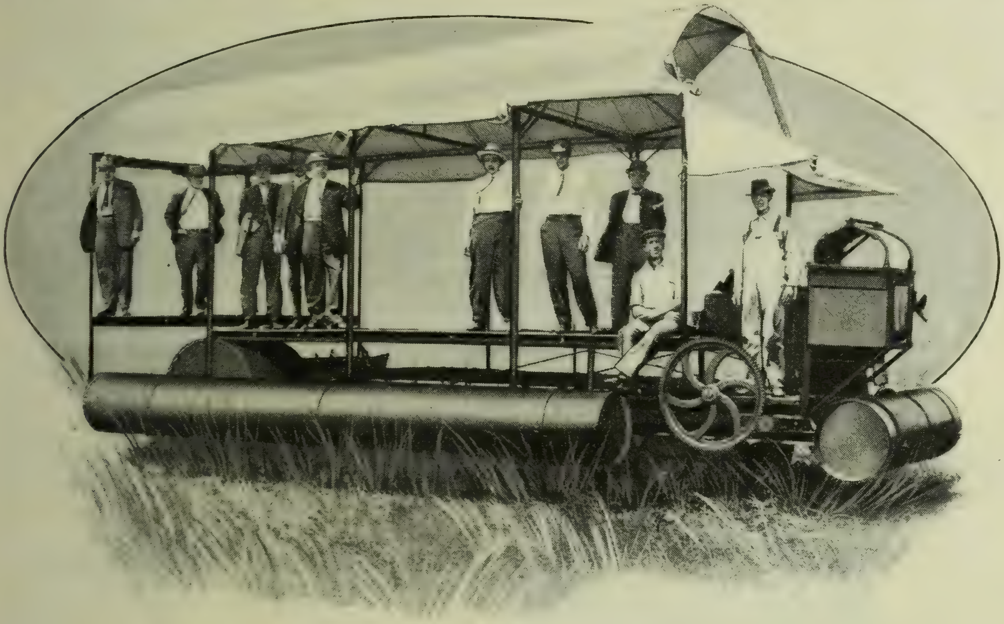






The experiments demonstrated a remarkable regularity in the folds or corrugations resulting from the compression. These corrugations, while varying with the diameter of the tube, the thickness of the walls and the nature of the metal, were always identical in tubes of the same dimensions and material. Another curious and unexpected fact brought out by the tests was that the folds or corrugations produced were the same in number and in shape, whether—other conditions being equal—the compression was the result of a sudden shock or a slow steady pressure.

THE WATER AUTOMOBILE OF THE EVERGLADES



Engineers and Surveyors on Board the Water Automobile That Navigates the Florida Everglades

A really practical water automobile has solved one of the hardest problems incident to the draining of the Everglades of Florida: that of running the survey lines through the vast swamp. The machine, which so far has been given no name, was designed and constructed by Maj. J. O. Wright, chief engineer of the State of Florida. He built it because it was necessary in his business, and today engineers and surveyors running lines through the Everglades are blessing his name as they work in safety and comfort from the platform of the strange craft.

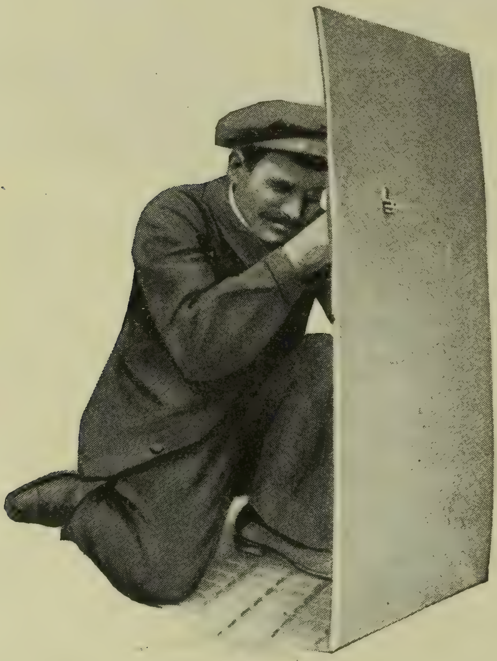
So slow and painful was the work of running the lines to mark the great canals designed to grade the Everglades, that Major Wright was sorely puzzled, and on several occasions almost discouraged. Then he put his wits to work, determined not to be beaten by a lot of water and a few millions of acres of soft, black mud, and as a result the water automobile came into existence.

The machine was not built for beauty, nor for speed, and it glides over the glades and through the water at a rate of only three miles an hour, but it has proven itself effective. It consists of a framework of light steel and oak, 25 ft. long and 8 ft. wide, mounted on three wheels, the two in front being of iron and very wide-rimmed, so as not to cut into the soft mud over which the machine has to pass. The rear wheel is a large wooden roller or drum, designed to crush down the tall saw grass as the craft proceeds. Surrounding the framework, and only a few inches above the ground, is a large air-filled steel cylinder, which keeps the machine afloat while crossing sheets of water. In the "bow" of the craft is a gasoline engine, which transmits power to the front wheels when the machine is crossing surfaces on which the wheels may be driven, or to an ordinary screw propeller, such as used on motorboats, for propulsion through the water. This propeller is under the machine, back of the front wheels, well out of the way when the machine is traveling as a land automobile.

On the framework of the machine is a platform, strong enough to hold a score of men. Here the engineers and the surveyors work, eat and sleep, an awning keeping off the direct rays of the sun. Two men are required for operating the machine, which is doing in a day work that formerly required a week or more.

THE SHIELDS OF THE PARIS POLICE

In the August issue of this magazine was published a short article with illustrations of the riot shields designed for the Liverpool police following riots in which many members of the constabulary were severely injured by bombardments of bottles, brickbats, and other missiles.



A Type of Shield being Used by the Paris Police in Sieges Directed against Bandits and Rioters

In the accompanying illustration is shown the same protective idea, as adopted by the Paris police for use in fighting barricaded bandits. The shields were used in a recent siege of automobile bandits and proved practical. Although much more unwieldy than the English shields, they provide protection for the entire body, when set on the ground in front of the user. They are not, however, designed to be carried about on the back of an officer, as are the English shields.

THE RUSSIAN GOVERNMENT AS A TEA GROWER

Near Batum, on the east coast of the Black Sea, the Russian government is busily engaged in the cultivation of tea. About 200,000 lb. per year is now grown, and the tea plantations are being extended at the rate of about 135 acres each year.

The government land devoted to this experiment in tea cultivation, and also to the cultivation of oranges and other fruits, and of bamboo, consists of 43,000 acres, which was formerly a hopeless tangle of rank vegetation. A considerable portion has already been cleared, the tea plantations covering about 1,400 acres at the present time.

¶Among the most important exports from Strassburg, Germany, are listed clocks, hair nets, goose-liver pies and rabbit skins, a queer assortment, but extremely valuable to the thrifty Germans.

TACTICS IN ACTUAL AERIAL WARFARE

The question of which aeroplane, the pursuer or the pursued, would have the advantage in an actual aerial combat was recently asked by the French aviation journal L'Aero. The question was formulated as follows:

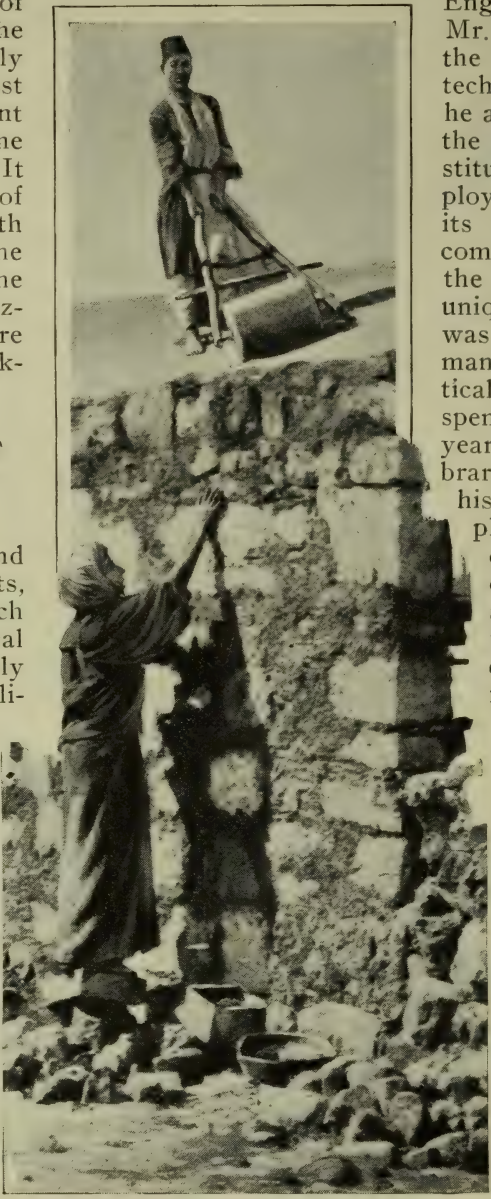
"Assuming that two aeroplanes be flying at the same speed, the same altitude, and with equal armament, one pursuing the other; which, the pursuer or the pursued, can damage the other with the least risk of being itself damaged?"

The experts requested to answer this question included engineers, scientists, artillery officers, etc., and the answers, some of which were accompanied by detailed and intricate calculations, were almost unanimous in declaring that the fleeing aeroplane would have all the advantages. It would be practically impossible, they agreed, in view of the great speed of the machines and the strong adverse air currents, for the pursuer to inflict any serious damage by means of projectiles, while the fleeing machine could easily do considerable damage.

The advantages claimed for the fleeing aeroplane would consist not only in the longer range of its projectile (the difference was calculated by one expert to be at least 130 ft.), but also in the fact that an aeroplane rushing against a projectile would naturally be liable to greater damage than one running away from it at great speed. It was concluded, in fact, taking into consideration the nature of projectile most likely to be discharged from aeroplanes, that the fleeing aeroplane would scarcely sustain serious damage even if hit. This was the opinion not only of officers of the army and navy, and of gunnery experts, but renowned mathematicians reached the same conclusions through considerations of a strictly theoretical nature.

"ROLLING" A ROOF

Steam rollers in paving and politics are common enough in America but a man-power roller of the type shown in the photograph is entirely unknown. One must needs go to the Orient to witness the scene here reproduced. It represents a resident of Bireh, Palestine, north of Jerusalem. The roof is of earth and the efforts of the fez-topped individual are directed toward making it rain-proof.



A Native of Palestine Rolling His Dirt Roof to Make It Rain-Proof

LIBRARY OF ELECTRICAL SCIENCE

Thirty thousand books and pamphlets, three-fifths of which deal with electrical science, have recently been added to the library of the Massachusetts Institute of Technology. The collection, which was once the property of the late George Edward Dering, an English inventor, noted for his eccentricities, was purchased by Theodore N. Vail, president of the American Telegraph and Telephone Company, and by him presented to the Massachusetts institute. The collection is valued at about $100,000. For its maintenance Mr. Vail added several thousand dollars to his gift.

The claim is made that the Dering library is the most complete collection of recent works on electricity in the world, a possible exception being the library of the Institute of Electrical Engineers in London. Mr. Vail, the donor of the library, is not a technical man nor has he any connection with the Massachusetts institute, save in the employment of many of its graduates in his company. Mr. Dering, the collector, was a unique character. He was wealthy, but for many years lived practically a recluse. He spent more than 40 years acquiring the library and it became his chief hobby. He placed an unlimited order with a London bookdealer for all books on electricity, in whatever language offered. In addition he attended sales and obtained books from many other sources. It is said that probably 14,000 of the volumes had never been opened by him. The books in the collection not dealing with electricity are concerned with iron and steel.

The total number of volumes contained in the library of the institute now reaches 100,000.

ℭA three-deck pontoon, 100 ft. long, has been built entirely of reinforced concrete for the Manchester ship canal.

An Aeroplane Which Came Out Better than a Stone Wall in a Collision at Hammondsport, N. Y.

AEROPLANE COLLIDES WITH STONE WALL

The operator of an aeroplane flying above the Hammondsport, N. Y., aviation field, failed to shut off his power early enough on making a landing and the machine ran into a stone wall. Although an aeroplane is usually credited with being of very delicate construction, the stone wall received the worst of the bargain. The collision moved approximately one ton of stone about 12 in., yet the only apparent damage to the aeroplane was a broken front wheel.

SPRING WATER FLOWS OUT OF TREE

A spring of clear, cold, sparkling water is always a welcome natural resource, but such a spring discharging its water out of the trunk of a stately elm tree is of unusual interest.

The tree-spring in question is near Lafayette, Ind., back of which are hills containing several large springs. Some years ago one of these springs was piped to the foot of the tree, which had an opening in its base extending to

A Spring of Sparkling Water Discharging from an Elm Tree near Lafayette, Indiana a considerable height in the trunk. The pipe was run underground into this opening and then up into the trunk. Then nature quietly concealed the work of man, and today there is no visible evidence of it.

The tree stands at the edge of one of the most frequented automobile roads in Indiana. Many automobile tourists see the water gushing from the tree, stop to investigate, but usually go away without having been able to solve the puzzle.

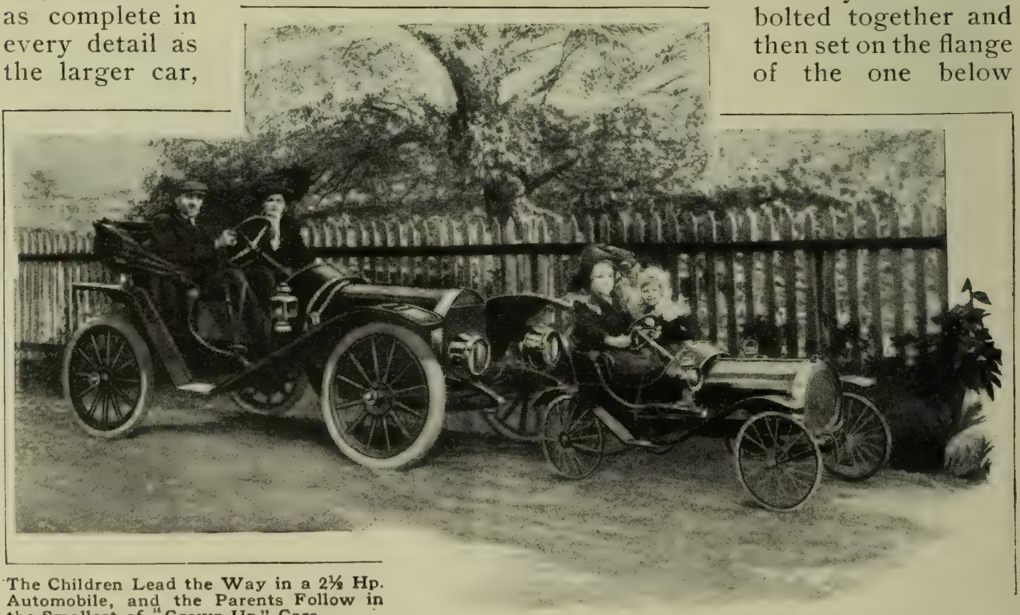
A NOVA-SCOTIAN AUTOMOBILE FAMILY "EN TOUR"

Miniature automobiles for children have ceased to be particularly rare in that the number of them is steadily growing, but the little machine used by Eva and Gladys Rafuse, of Windsor, Nova Scotia, is of considerable interest because it is part of the family caravan. The parents of the children ride in one of the smallest types of automobiles made for grown-ups, and this little "grown-up" car, running along a country road with the children's car leading the way, never fails to arouse admiration. The children's car, which is as complete in every detail as the larger car, is operated by the elder of the children. Its power is derived from a 2½-hp. motorcycle engine, and is sufficient to negotiate any hill in the vicinity.

WIRELESS MASTS BUILT IN FOUR DAYS

The Marconi station at Poldhu, Eng., which has recently been adapted to receiving as well as sending messages, has established a record in erecting masts to support the aerial. Six masts, two of steel and four of wood, were put up in four days. The steel masts are 265 ft. high and the wooden ones somewhat shorter. The old wooden lattice columns have been demolished.

The two steel masts stand next the sea and support the triple stay of the aerial at a height of 250 ft. The wires run back from this in two groups of eight to stays supported by the wooden poles. No scaffolding was used in the erection of the tubular-steel poles. Instead they were put up section by section. Each section was 10 ft. long and semicylindrical in shape, with a flange at each end and longitudinal flanges down the sides. The halves of each cylinder were bolted together and then set on the flange of the one below



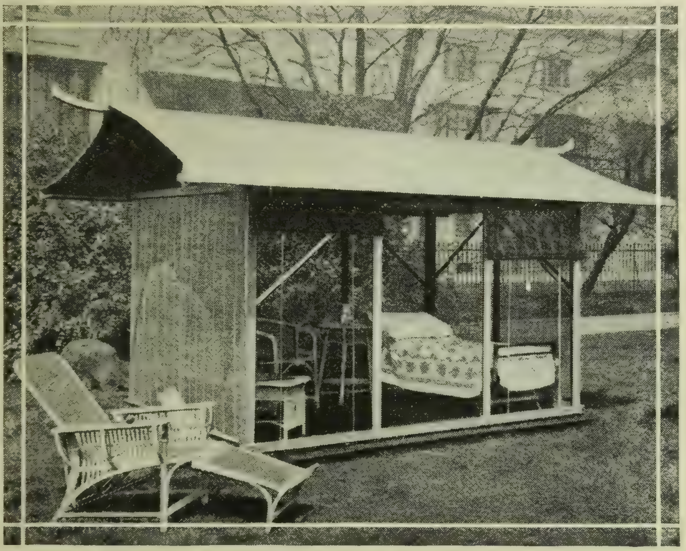
The Children Lead the Way in a 2½ Hp. Automobile, and the Parents Follow in the Smallest of "Grown-Up" Cars and bolted to it. As each tubular section was put in place, a wooden pole was inserted in the upper end and used as a derrick to draw up the two semicylinders of the next section. These were held on each side of the wooden pole until bolted together and fastened to the lower section. Then the wooden pole was withdrawn and the process repeated.

UNDERGROUND LAKE SOURCE OF WATER SUPPLY

For three years a commission of engineers have been attempting to solve the problem of obtaining for the Campine coal district of Belgium a supply of water from a subterranean lake discovered just prior to the appointment of the commission. A recent report states that the underground reservoir has an area of over 160,000 acres at a depth of from 80 to 100 ft., and that with a width of 1¼ to 2½ miles it extends over the territories of eleven communities. At present Lower Belgium is dependent on rain water for its supply. The subterranean lake is said to provide the only source capable of supplying water to the population of Antwerp and Flanders, which in 25 years is expected to reach 4,000,000. To procure water from the subterranean source a system of filtering well shafts is recommended as allowing the water to be collected at a great depth without risk of contamination or of any change in its temperature. While the collected water is exceedingly pure, owing to the filtering properties of the soil, it contains a certain amount of iron from which it will have to be freed.

¶The British government has recently launched a motorboat of 200 tons' register, designed for the use of its consular service on the Congo River.

BAMBOO SHELTER FOR LAWNS AND GARDENS



An Artistic Portable Shelter for Town and Suburban Lawns

A particularly practical and artistic portable garden house or shelter, oriental in general design, has been popular in England during the summer months. It is easily erected and moved, substantial in construction, and is made in sizes ranging from 5 by 7 ft. to 7 by 10½ ft. Split-bamboo adjustable blinds are fitted on all sides, and may be raised or lowered by pulling the cords.

FIRE EXTINGUISHER FOR CABLE BOXES

A novel method of fighting fires which originate in telegraph, telephone and similar installations has been invented and gives promise of proving effective. In such installations bundles of cables are placed in boxes which render them almost inaccessible.

Short circuits, due to various causes, frequently occur and serious fires have resulted. Water cannot safely be used for extinguishing a blaze of this character as that would increase the danger of further short-circuiting. The inventor's method of extinguishing such fires includes a system of pipes by which two different extinguishing gases are conducted to the point of the fire. There the gases combine, forming a powdery substance which stops the progress of the blaze. The gases are not retained in the pipes constantly, but when fires occur, the pipes are filled with the gases which are discharged at the required places. The gases employed are composed of ammonia and carbonic acid, or ammonia and sulphur dioxide.

PHOTOGRAPHIC STUDIO IN "DARKEST" AFRICA

Near Elizabethville, Congo, is a photographic studio in which white man or native can sit for a photograph and rely upon a first-class likeness. The studio, which is constructed of bamboo poles and has a grass roof, was established a few years ago by an Englishman, who lays claim to be the pioneer photographer of Darkest Africa. He states that his most critical clients are the dark maidens of Congo, who are as particular about getting a good likeness as their white sisters, and who delight in posing.

A Well-Established and Prosperous Photographic Studio in Darkest Africa

NEW RECORDS ESTABLISHED BY SKYSCRAPER

The builder of the new 30-story office building on West Fortieth Street, New York City, makes claims of supremacy for it in several respects. While it does not attain the height of several other New York "scrapers," he declares it is the tallest building ever erected on so small a plot of ground—90 ft. by 98 ft. 9 in. In making this claim he adds others, including the following: That the new building is the only building of this height having an absolutely fireproof and smokeproof tower with entrance from the exterior, connecting at the bottom with the street; the tallest building ever erected on a side street; the only office building having every suite above the fifth floor a corner suite; that it has the largest number of windows of any building in proportion to size; more windows than any other building of any description ever erected in proportion to area of ground covered, and, "probably," is the only building in the world that has not one particle of wood in its construction. No one has disputed these remarkable claims to date.

COMMENT AND REVIEW

How Speed Mania was Cured

NOT all persons upon becoming the owner of a motor vehicle imagine the price paid for the machine includes ownership of the streets, but a good many seem to have that impression. The change from dodging a car to being dodged is apt to be one in which the rights of the pedestrian are quickly forgotten. In our large cities the loss of life from automobiles and motorcycles has grown to be something frightful, and largely unnecessary. In some European cities the remedy is to arrest and fine the one who is so slow and stupid as to get run over—that is, if he survives. But no such process of law will be tolerated here, nor should it. On the other hand, motor cars are a modern necessity and the streets are no longer a safe place in which children can play. There must be moderation and caution on the part of both.

The enforcement of a reasonable speed reduces the accident and death rate to a minimum, and Chicago has demonstrated that such a reform can be easily accomplished in a few days. Several deaths each week from motors had rolled up a total of 75 in a short time, and something had to be done. This is the cure, and it was accomplished in a few days: While 15 miles an hour is the legal high speed, 20 miles was unofficially assumed to be the limit. Anyone exceeding that speed was promptly arrested and fined heavily, with the promise that the amount would be doubled for a second offense. Instead of the cases being brought before some friendly magistrate in the district where the arrest was made, all cases were heard by one judge. This permitted a system of records, with the promise that something beside fines would be imposed after the second offense. For about a week the fines aggregated over $500 a day and then suddenly dropped. The effect was very noticeable after the third day; at the end of the first week there was really very little violation of the rules. The reform was accomplished so easily and quickly, that there seems no need for any other speed-infested city to longer tolerate such a needless condition of danger.

* * *

Control of Floods

FLOOD control of the Mississippi valley was declared to be an engineering project second only to the Panama Canal, by the Deep Waterways Commission held in Chicago. It was agreed that only through Government could control be secured, but that returns from water powers thus created, and the sale of reclaimed lands would go far toward capitalizing the enterprise. The increasing volume of the annual floods was shown to be due not to any material increase in their original form of rain or snow, but to artificial conditions. In the northern states thousands of miles of tiling have been laid by farmers to drain swamps, low lands and small lakes, which enables the rapid escape of excessive water. Thus thousands of small harmless floods are dumped into the Mississippi to unite and descend in one overwhelming disastrous avalanche of water.

It was shown that the remedy for this need not be the discontinuance of drainage of northern low lands, but the construction of enough reservoirs to hold and control the abnormal spring freshets near their source. Also that great good could be accomplished if northern state farmers would plow their land from 12 to 18 inches deep, instead of 5 or 6 inches as at present. This would give the soil an opportunity to absorb and retain a much larger quantity of moisture, amounting to as much as 40 to 50 tons of water per acre, and which, it was claimed, would increase the value of crops throughout these states fully threefold.

One of the interesting developments of the convention was the announcement that there are three possible routes for the diversion of excess water of the upper Mississippi by canals to Lake Michigan: First, from St. Paul to Green Bay, 259 miles; second, LaCrosse to Milwaukee, 185 miles; and third, Galena to Chicago, 152 miles.

The damage caused by the 1912 flood is estimated at $200,000,000. Two such floods alone cost as much as the Panama Canal.

The subject is one which is bound to receive attention from now on, and will be considered at the meeting of governors at Richmond, at which time a permanent board will be appointed to investigate and report.

* * *

Future of the Dirigible

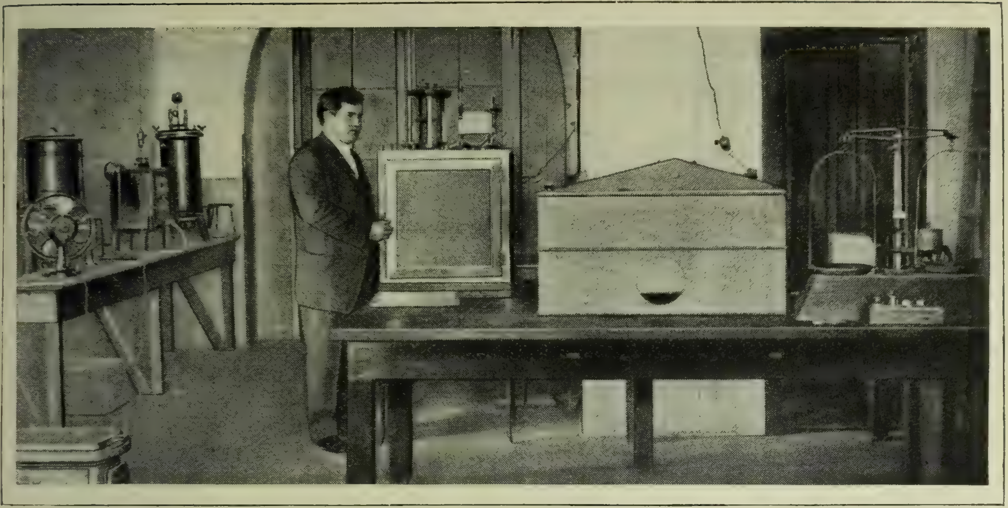
THE destruction of the great aircraft "Akron" was accomplished with a suddenness which is appalling—being reduced to nothingness literally in the twinkling of an eye. The event is doubly deplorable, chiefly for the loss of its brave men, but also for the failure to accomplish that greatest of attempted aerial feats—the crossing of a vast ocean. In all probability safety devices were responsible for the disaster—and what was calculated to save life operated with contrary result. To prevent the bursting of the envelope when the contained gas expanded from the sun's heat, six safety valves were installed to relieve unusual pressure. These valves, it seems, exhausted gas at points perilously near to the engine exhausts, which frequently spit sparks and fire. If the undertaking was destined to end so tragically, we may be thankful to be spared the long days and nights of uncertainty which followed André in his disappearance.

If the ocean could be crossed at this time by any man in a dirigible, surely Vaniman with his training and experience was well qualified to accomplish it. And while the disaster will likely defer the time of another similar effort, it by no means follows that no more attempts will be made.

The "Akron" undoubtedly embodied the best that experience could suggest, skill could fabricate, or money buy.

The final cruise of the "Akron" has resulted in little more than emphasizing the difficulties and dangers of piloting a big dirigible across the Atlantic. That they played and lost should not detract from that measure of admiration which is due the brave young men who staked their lives on the chance to write their names high in history. America is indebted also to those other men who provided the princely fortune that was spent in building the huge aircraft. Evidently we are yet knocking at the outer gate of air conquest, and many more brave lives must be yielded up before the secret of scientific aviation is wrested from its stronghold.

H. H. WINDSOR



Experimental Apparatus for Artificially Ripening Dates, Showing Electric Ovens

RIPENING DATES IN AN INCUBATOR

The discovery of Prof. G. F. Freeman, of the Arizona state experimental station, that the incubator will ripen dates to a perfection that rivals the fruit brought direct to the Paris markets from Africa has revived the interest of the fruit growers of the Salt River Valley in Arizona, and today the fruiting date palm is being extensively cultivated.

When, some 10 years ago, the United States Department of Agriculture sent a large consignment of the choicest varieties of date palms to Arizona they were planted, but when the fruit began to develop, difficulty was experienced in securing a date that was of value commercially.

Hot water, vinegar, gasoline, and a score of other substances were found that would ripen dates artificially. Of these vinegar was found best suited for practical work, but still the experimental station was not satisfied with the result.

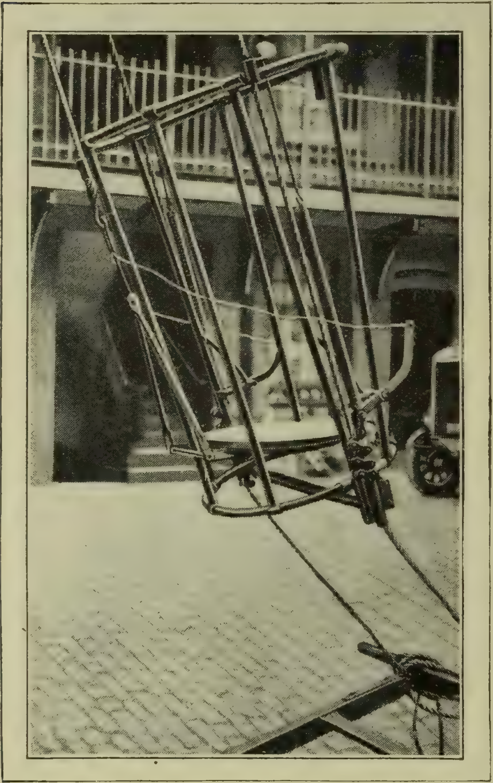
It remained for Professor Freeman to attempt submitting ripening dates to the heat of the incubator, and the experiment was a pronounced success. Now the dates are picked when they show the first signs of ripening; are washed and placed in an oven where they are kept in a moist atmosphere and held at a temperature of between 110 and 115 deg. F. for three days. At the end of this time they are fully ripened.

LEGAL STATUS OF AIRMEN IN ENGLAND

In spite of the great strides which have been made toward complete conquest of the air, the flyer is as yet almost an unknown quantity with regard to his rights and privileges in legal circles. This fact was brought out in a recent suit for damages instituted by Alfred Rawlinson, an English airman, against the promoters of the air meet at Bournemouth in July, 1910. Rawlinson charged that the starting ground was not properly prepared and as a result he met with an accident in which his leg and shoulder were broken. At the hearing dense ignorance of airmanship was displayed by both judge and counsel, the former stating that he knew nothing about flying, and Rawlinson's own lawyer said he believed "the aeroplane was attached to hooks in the ground" before starting.

A NEW ENGLISH FIRE-ESCAPE TRUCK

The fire department of Birmingham, Eng., has been testing a new type of fire escape by which the persons rescued reach the ground in a cage or cradle raised and lowered by means of a cable, and guided by side cables. The apparatus is run to a fire in the same manner as a ladder truck, the escape tower is then extended up along the building, and the cradle is raised and lowered like an elevator cage.



The Cradle or Cage of a New Type of Truck Fire-Escape Tested in England

The cradle is provided with an automatic brake which fixes the cradle on the guide cables should the lifting cable break.

¶Hubert Latham, one of the pioneer airmen who quit flying because of the danger, was recently killed by a wild buffalo while hunting in the Chari River district of French Sudan.

SPECIAL DRILL FOR CANAL-LOCK GATES

Sixteen electric machines have been specially built for use in drilling and reaming rivet holes in the lock gates of the Panama Canal and are now in operation. The machines are of such a character that they can readily be adapted to similar use on other large contracts after the canal is completed. They are not the first pieces of machinery which have been created especially for use at the "big ditch," but they possess several improvements.

Each of the machines weighs 6 tons and is designed to run on a standard-gauge track which is placed on a stage and swung from the top of the big steel gate on chains and brackets. It is claimed that each machine does the work of five ordinary reamers. Each machine is provided with four changes of power which are instantly available by means of a quick-change gear. The two distinguishing features of the machines are the range of nine speeds, and the fixed spindles arranged to space the rivet holes in the lock gates uniformly.

CONCRETE-WORK CRACKS BEING STUDIED

Cracking of concrete due to variations in temperature is deemed a matter important enough to receive attention from the National Bureau of Standards, of the Department of Commerce and Labor. In order to obtain statistical data, reference marks have been placed on typical old and new concrete work in Wayne County, Mich., and at Greenwich, Conn. During the summer and winter measurements will be taken to determine the expansion or contraction caused by high and low temperatures. The change of volume taking place during the hardening process will also be considered. The lock walls of the Panama Canal and various other structures from which data valuable to builders will be collected have been similarly marked.

Children Fishing for Carp in a Los Angeles Park

CARP FISHING IN LOS ANGELES PARK

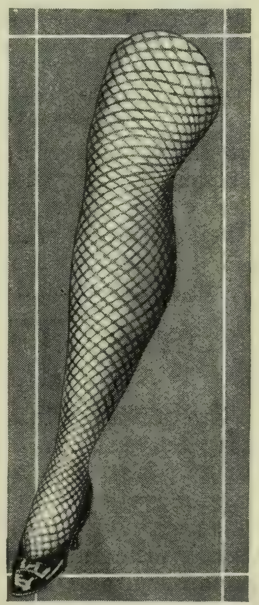
Thanks to an over-production of carp in the Los Angeles parks, the children of that city were recently given an unexpected fishing treat. The lakes at Echo, Eastlake and Westlake Parks were opened to anglers under 16 years of age, and hundreds of children responded to the invitation of the park commission. The limit for each catch was 12 fish, but as the carp weighed from a half to more than a full pound, this was a liberal allowance and no one objected to the restriction.

The banks of the little lakes or ponds were for days lined with happy youngsters armed with all kinds of tackle, from the bent-pin, cotton-string and broken-branch variety to the split-bamboo pole and braided-silk line borrowed from "dad's" vacation outfit.

Dough or bread was the most acceptable bait, and the carp fought greedily for it the first few days, and fishing was rapid-fire work. Toward the end of the first week, however, they became more wary, and the children learned the lesson of fisherman's patience.

THE NEW OPEN-WORK STOCKING

The up-to-date open-work stocking, fashionable this summer, differs from its predecessors in the past in the great size of the mesh. An English magazine characterizes it as "one of the net results of fashion," and it certainly is netlike in appearance, closely resembling a veil.

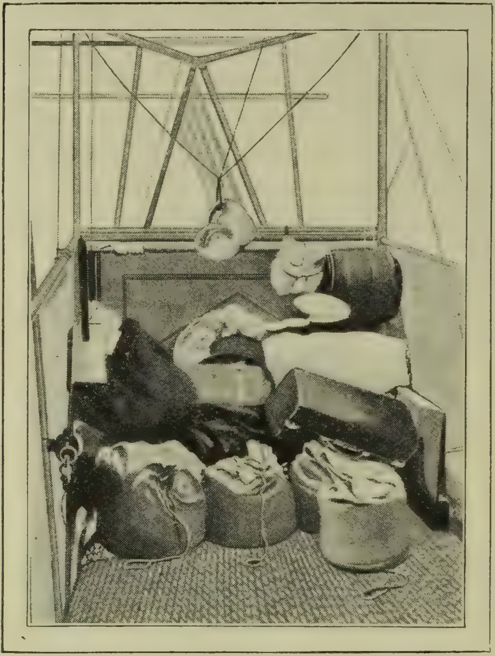


Courtesy the Sketch, London

ℭAn interesting result of the "Titanic" disaster is the determination of the family of the late Isador Straus to perpetuate the name of the famous merchant and philanthropist who sank with the big ship, by always having an Isador Straus in the family.

BAGGAGE ROOM OF AN AERIAL EXPRESS

Provision for the carriage of baggage is as necessary on an aerial express as on a land express, and in the illustration may be seen the baggage section of the "Clement-Bayard IV," one of the latest of this famous type of dirigible balloon. Traveling bags, rolled steamer rugs, and canvas bags are piled at one end of the car.



Courtesy the Sketch, London

Small Baggage Piled in the Baggage Section of the "Clement-Bayard IV"

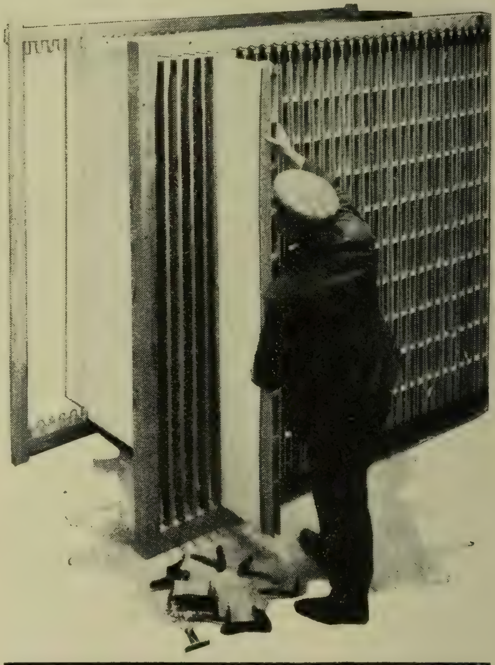
LUBRICANT TESTS MADE BY MACHINE

The quality of lubricants used on fine machinery of various kinds is a matter of great importance and one that has long engaged the attention of engineers. To avoid the necessity of testing the lubricants on expensive machinery, and to economize time, an English concern has developed a machine which is used exclusively for this purpose.

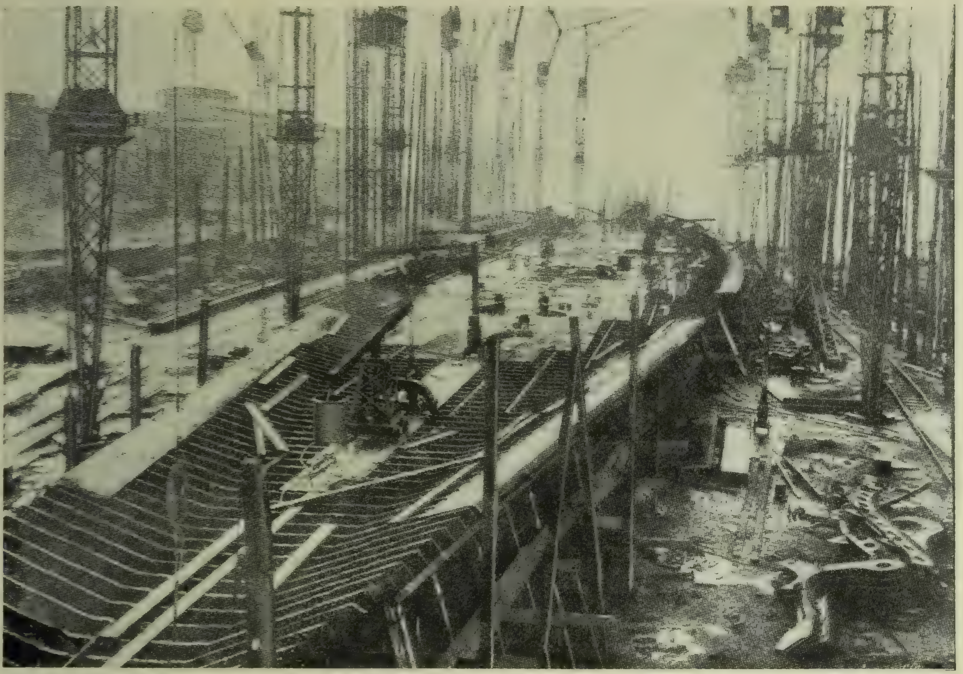
Steam is used in the process of determining the quality of various oils and showing to what degree, if any, disintegration and formation of sediment takes place. After the test is completed the oil is blown onto a slip of paper, and the changes it has undergone during the test are then disclosed. A further test follows, to determine what alterations affecting its lubricating properties result from the effect of heat. With automatic precision the machine indicates, on the same slip of paper, the degree of friction and the temperature of the frictional surfaces, as well as the absolute and relative values of the oil under test. The number of revolutions made by the machine in testing the oil also is indicated.

FILTERING AIR FOR DYNAMO ROOMS

All air that enters rooms where electric generators are operating is kept clean by a novel filtering apparatus in the great electric-railroad power plant at Altona, Germany. The elimination of dust from around dynamos is no new idea, and is of great value in the operation of the machinery, but in this



Inserting a Clean Cloth-Covered Pocket in an Air Filter Built Up in Sections



View of the Watertight "Tank Top" on the "Aquitania," Now Building in England, Which is to be the Largest Liner

instance the idea has been worked out so that the filtering will take comparatively little attention.

Wooden cases which contain the dust-proof cloth are built so that each separate filtering pocket can be removed from the frame without disturbing the others, thus making it possible to easily remove soiled or damaged pockets. As each pocket, covered with cloth, is inserted in the frame, the necessary tension to the cloth is developed automatically, and no eyelets are needed in the cloth, thus avoiding trouble in laundering or in cleaning with a vacuum cleaner. Another advantage is that the filter can be increased or decreased readily in size by adding or taking away pockets at the ends.

¶Although the automobile may be displacing the horse, it is interesting to note that no less than $4,000,000 was given for prizes at horse races in the United States and Canada last year.

NEW OCEAN LINER WILL HAVE "TANK TOP"

Details of the construction of the "Aquitania," which is to be even bigger than the "Imperator," the largest ocean liner now afloat, are being withheld by the Cunard line, but some of the facts about the new vessel have come out, the most interesting being that the liner will have a tank top, so that there will be a watertight tank in the bottom of the vessel extending the entire length and breadth. The naval architect of the line testified at the British "Titanic" hearing that the "Aquitania" was to have a continuous watertight deck, presumably this being the top of the "tank."

The size of the vessel is not definitely known, but it is generally understood that it will be at least 10 ft. longer than the "Imperator," or 891 ft. The "Aquitania" will be driven by turbines of the Parsons type working four propeller shafts, the wing propellers being 86 ft. forward of the rear pair.

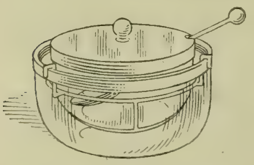
Courtesy the Sketch, London

Water Running with Aquatic Shoes at One of the German Watering Places

SKI RUNNING ON THE WATER

Many attempts have been made to design a water shoe which would be practical for everyday use, but practically all of them have failed because too heavy and cumbersome. The water-running shoes now being turned out by a German firm, however, are said to overcome these difficulties, and are being used to a considerable extent at one of the German water resorts. The water shoes are about the size of snowshoes, and pointed at the ends. They are inflated with air before using.

SALAD DISH WITH ICE COOLER



Ice-cooled salad, without contamination by direct contact with the ice, is made a simple matter by the device shown in the illustration. The dish is constructed double, so that the ice may be placed between the inner and outer bowls, and the salad kept cool in the inner bowl.

◆

¶The use of the aeroplane and the need for better materials in its construction than have heretofore been necessary have brought into existence a steel wire to be used for guys which has a tensile strength of 350,000 lb. per square inch, despite the fact that it is only from 1/50 to $\frac{1}{10}$ of an inch in diameter.

PREDICTING EARTHQUAKES

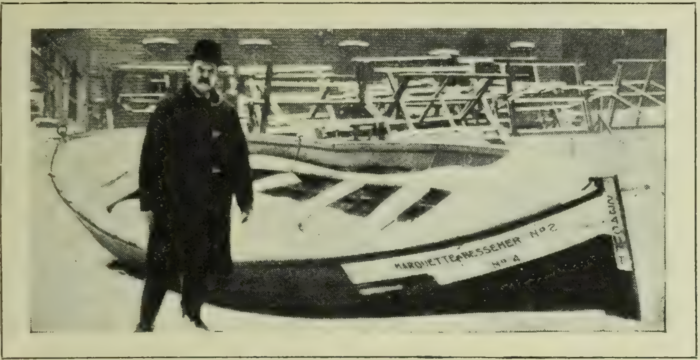
That earthquakes of the future may be accurately predicted is again promised, this time by M. Koeveslighety, a scientist who has been investigating the origin of the phenomenon. He does not claim the problem is entirely solved, but announces that with means already available, quakes may be foretold with a degree of accuracy. He considers the primal cause of the earthquake not an external factor, whether of the earth's crust or due to atmospheric conditions. These elements, in his belief, merely precipitate the shock, which is actually due to excessive tension at some point, the essential thing being to determine where such tension exists. The speed with which ordinary earth waves travel, as recorded by a seismograph, will indicate the amount of tension, and thus furnish the basis for predictions.

"ATMOSPHERE" IN STAGE LIGHTING

Fortuny, a Parisian scenic artist, has invented a new and wonderful stage-lighting arrangement, differing entirely from the methods hitherto in vogue. His scheme, which has been successfully introduced in the Royal Opera House, Berlin, and is now being installed also in the new Comedy House at Frankfort-on-the-Main, consists of an arrangement of white muslin, covering the stage and forming a hemisphere upon which the light is projected. The claim is made that this produces a more natural diffusion of light and makes possible intricate lighting effects which could not otherwise be obtained. On account of the equalization of the projected light on all parts of the stage through the new method, even the time-honored footlights are rendered useless and will be abandoned. Moving clouds, waves and other effects are easily obtainable by throwing the proper slides on the hollow hemisphere of muslin and colored effects are produced by passing the light rays through suitably colored cloth screens.

LIFEBOAT LESSON IN SHIPYARD

The lesson of the value of lifeboats, in spite of all the contentions that a lifeboat is too unstable to do more than satisfy the anxieties of passengers, has been present all this year in the yards of a shipbuilding concern in Delaware, and forms an excellent answer to some of the testimony developed in the British "Titanic" hearing. It is a boat which withstood three days of storms on Lake Erie last December and was still seaworthy when picked up by a passing steamer. The boat had been launched from the steamer "Marquette Bessemer No. 2" when that vessel was foundering, and when picked up by the "Commodore Perry" the nine men who manned it had all died from the intense cold. Yet, without any crew to steer the boat, and in spite of the lack of balance, due to the uneven distribution of the bodies, the boat had kept up.

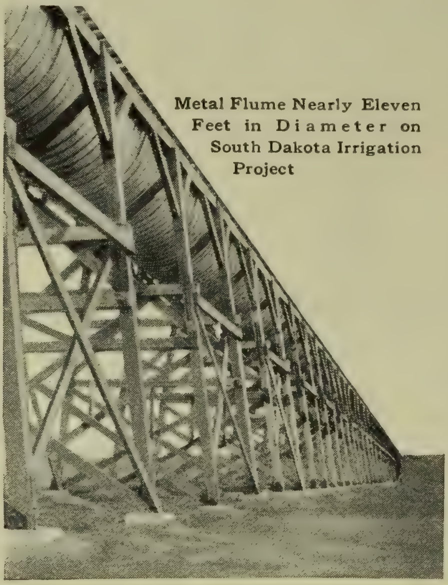


Lifeboat of "Marquette Bessemer No. 2" Which Floated through Three Rough Days out on Lake Erie

MONSTER METAL FLUME FOR IRRIGATION

A monster iron flume has been erected by the United States Reclamation Service at Belle Fourche, S. D., which measures 1,300 ft. in length and 10 ft. 10 in. in diameter and is made of No. 16 gauge so-called Toncan metal. This is a very pure iron which, although made by improved methods and on a large scale, is said to be almost identical in composition with irons produced by the slow and complicated processes of centuries ago, but which had more lasting qualities than the modern product.

A large proportion of the flumes installed during the past year were of this type, including one in Massachusetts, where irrigation is a rarity. A mile of twin flumes of a diameter of 9 ft. 6 in. each, which will eclipse the Belle Fourche flume in length, are now being installed for irrigation service.



Metal Flume Nearly Eleven Feet in Diameter on South Dakota Irrigation Project

These iron flumes were designed and constructed in sections at Denver, Colorado, and are galvanized to resist corrosion.

REINFORCING STEEL WATER TANKS WITH CONCRETE

Recent unexplained failures of large steel water tanks in various parts of the country have caused the Los Angeles water department to reinforce a 528,000-gal. steel tank with concrete. The capacity of the tank was increased to 593,000 gal. by adding 5 ft. to the height, and the steel shell was incased in reinforced concrete having sufficient strength in itself to withstand the hydraulic pressure with an ample factor of safety.

The jacketing of the black steel shell is also a great improvement from an artistic standpoint, as the tank is visible for many miles up the San Fernando valley. The ordinary tank in such a location is distinctly an eyesore.

EFFECT OF DREDGING ON "SWELL"

During the last four years the River Weir Commission of Sunderland, Eng., has been watching the effect of deepening the harbor, by dredging, on the swell which has been conspicuous at that point. A pier of which 2,676 ft. had been completed, leaving 168 ft. to be constructed, was left untouched during this period in order to ascertain what effect, if any, the increased depth of water and expansion of navigation channels would have in leading the swell into the harbor. It has now been found that the dredging has not resulted in any appreciable difference. In view of this result the pier will not be extended beyond its present length more than may be necessary to complete the unfinished end in a permanent manner.

EDIBLE BOUQUETS REPLACE BOXED SWEETS

The fashionable feminine theatergoer in Paris no longer carries a box of sweets with her, but is provided by her escort with a dainty bouquet of crystallized flowers, such as violets, rambler roses, etc., artistically mounted on stalks, with petals made of thin strips of candied peel. This bouquet is picked to pieces and eaten during the performance, all of it being edible.

The Candied Bouquet Which is Taking the Place of Boxed Sweets for the Theatergoer

ℭCongress has been asked to authorize international gold notes for the convenience of travelers with values printed in currency terms of all nations.

THE WONDERS OF LIGHT

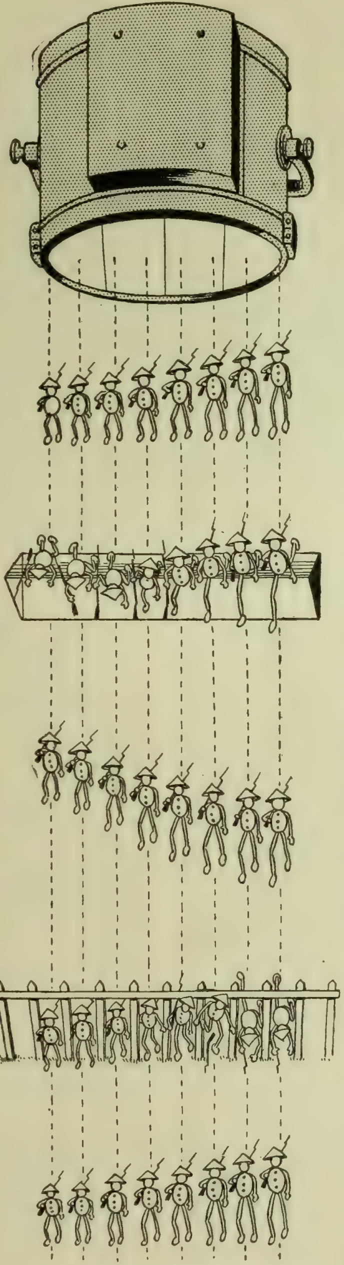
VII—The Magic of the Rainbow

By

J. GORDON OGDEN, Ph. D.

WE do not know what primitive man thought of the rainbow. Probably much the same as his descendants of a hundred thousand years later. The average man of today accepts the rainbow as a simple matter of fact, just as he does a sunrise, a star, or a flower. It has no deeper meaning for him, nor does he take the time and thought necessary to understand what is really a puzzle to him. Familiarity with any of the wonderful phenomena of nature is too often mistaken for understanding.

The great bow of gorgeous colors far-flung across the sky is one of nature's most impressive object lessons. And yet, in all the ages that have elapsed since man appeared, history tells us but little of any progress made in the explanation of the mysterious arch of colors. It was accounted an object of superstitious awe, a portent of the gods, a riddle too complex for man to unravel, or else, because it was seen so often, it had become commonplace like many another of nature's phenomena.



The Brotherhood of Light Rays. The top row represents one white ray of light, symbolized by a platoon of soldiers, of the various elements of a white ray, marching in perfect alinement, although some have longer legs (longer wave lengths) than their brothers. Obstructed by a prism of glass, the long-legged ones get over first, and so form a curved line—the spectrum of a ray of white light. It is possible to turn a spectrum back into a ray of white light, symbolized here by sending the soldiers under a low fence.

Color was considered as a property of matter. Everyone had observed the beautiful colors in splintered ice, the chromatic glories of a diamond or cut-glass prism, the iridescence of a polished shell, the shining luster of a film of oil on water, the marvels of a soap bubble, and the myriad hues of a rainbow, but no one thought that all these color phenomena were closely related. No one imagined them to be children of the same parent, and that the redness of a blush rose is due to the same cause that produces the wondrous harmonies of a sunset, the flush in the cheek of a maid, and the glittering brilliancy of an Arcturus billions of miles away in the depths of the ether. And not even in the most fantastic dreams of the poets and philosophers of old was there anything remotely prophetical of the fact that one day these colors would reveal the chemical components of the universe, and enable man to analyze in his laboratory, suns and stars, flashing afar in the infinite realms of space.

Kepler, a celebrated German astronomer (1571-1630) was probably the first to describe the effect of a prism upon white light, while Sir Isaac Newton (1642-1727) was the first to offer a scientific explanation of what takes place when a beam of white light is splintered into the wonderfully pure and beautiful colors, identical with those of the rainbow. Newton's description of his famous experiment is worth reading, and we therefore reproduce it, using his own words and spelling:

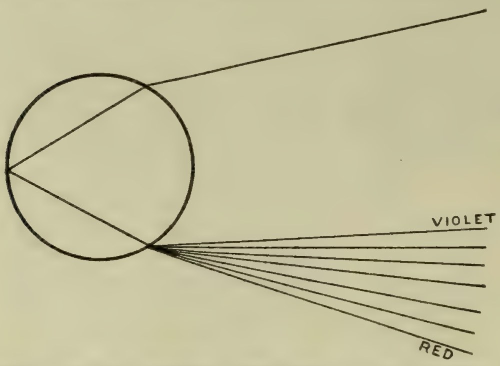


Fig. 1—A Ray of White Light Entering and Leaving a Drop of Water

"In a darkened room make a hole in the shutter of a window whose diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Sun's light; and there place a clear and colourless Prisme, to refract the entering light towards the further part of the Room, which, as I said, will thereby be diffused into an oblong, coloured Image. Then place a Lens of about three foot radius (suppose a broad Object glass of a three foot Telescope), at the distance of about four or five foot from thence through which all these colours may at once be transmitted, and made by its Refraction to convene at a further distance of about ten or twelve feet. If at that distance you intercept the light with a sheet of white paper you will see the colour converted into whiteness by being mingled. But it is requisite that the Prisme and Lens be placed steddy and that the paper on which the colours are cast be moved to and fro; for by such motion, you will find not only at what distance the whiteness is most perfect, but also see how the colours gradually convene and vanish into whiteness, and afterwards, having crossed one another in that place where they compound whiteness, are again dissipated and severed and in an inverted order retain the same colours which they had before they entered the composition. You may also see that, if any of the colours at the Lens be intercepted, the Whiteness will be changed into other colours. And therefore, that the composition of whiteness be perfect, care must be taken that none of the colours fall beside the Lens."

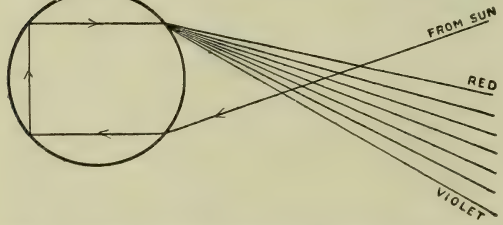


Fig. 2—A Ray of Light Entering a Drop of Water from Below is Twice Refracted

Newton, however, since he was an advocate of the corpuscular theory of light, could not give a correct explanation of the phenomena he had witnessed, as the undulatory theory of light is essential for a full understanding of this beautiful dispersion of white light into the rainbow hues.

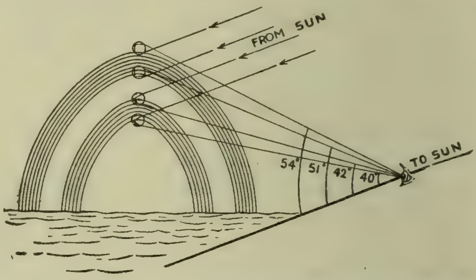
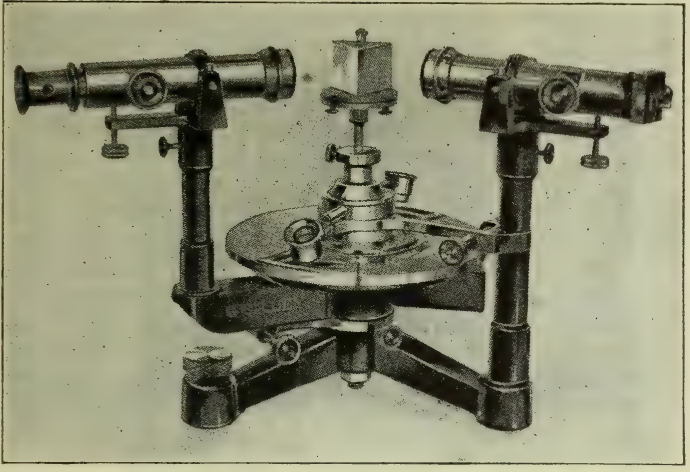


Fig. 3—Primary and Secondary Rainbows with the Angles at Which the Various Colors are Seen, Violet being 54 Degrees in the Secondary

Even as the alchemists of old named the vapor that distills from a solid or liquid when heated, a "spirit," and as Van Helmont gave the name "gas," from the German word "Geist," a ghost, to the invisible something that is mysteriously given off when certain substances are heated, so Newton gave the name, "spectrum" identical with our word "specter"—an apparition—to this band of colors, and so it has been termed ever since. It is also claimed that Newton named seven colors in the spectrum for the reason that the number seven was a significant and peculiarly sacred number to the alchemists and astrologers of the time. As a matter of fact, there are at least two millions of separate and distinct colors in the solar spectrum, and the common division into seven is meaningless.



The Spectroscope, by Means of Which the Spectrum of a Ray of Light is Studied

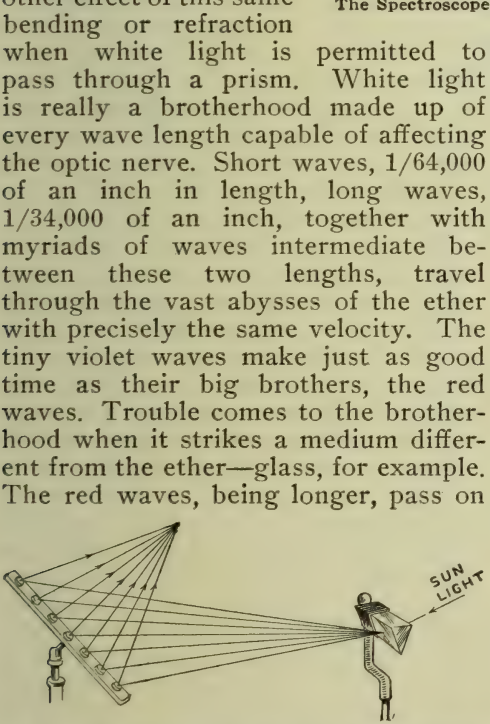


Fig. 4—The Dispersion of a Ray of White Light Passing Through a Prism and Subsequent Uniting of the Rays

And now, what is a rainbow? Whence the colors? Why is it always an arc? In a former chapter we discussed the effect of a prism on light, and studied the cause of the bending or refraction thus produced. We are now ready to study another effect of this same bending or refraction when white light is permitted to pass through a prism. White light is really a brotherhood made up of every wave length capable of affecting the optic nerve. Short waves, 1/64,000 of an inch in length, long waves, 1/34,000 of an inch, together with myriads of waves intermediate between these two lengths, travel through the vast abysses of the ether with precisely the same velocity. The tiny violet waves make just as good time as their big brothers, the red waves. Trouble comes to the brotherhood when it strikes a medium different from the ether—glass, for example. The red waves, being longer, pass on through a glass prism without much difficulty, the only noticeable effect being a slight change in direction after emerging from the glass. The other waves, violet most of all, seem to be more or less entangled with the electrons of the glass, and are bent away from their original course much more than the red waves. Hence when all the waves finally emerge, the brotherhood is broken up. This phenomenon is known as dispersion, and is illustrated in Fig. 4. This at least is the popular conception of what takes place in a prism. Strictly speaking, there are no colors in white light—just waves of different lengths. Color is subjective, and as we have shown, exists only in the brain. White light is a sequence of irregular wave trains, and a prism simply analyzes them into simpler trains that we recognize as colors. These simpler trains may be still further divided into their components, and it is quite impossible to say where this analysis must cease. The difference between sunlight and colored light may be understood by comparing the effect produced by forcing a yardstick down on the keyboard of a piano, and afterward striking a single key with the finger. White light is a discord wherein all the color tones are blended. A pure color is a single tone in the scale—a single wave length.

What has all this to do with a rainbow? Simply this: A raindrop is a double convex lens, made up of two prisms placed base to base. These prisms are just as much prisms as though they were made of glass. The brotherhood of light is broken up by the raindrops, and each of the brethren, free from one another, races down to the eye of the observer, and causes the sensation of color. As we see an object in the light that comes from it, the various drops of rain, seen at slightly different angles, seem to be colored—and we have the rainbow.

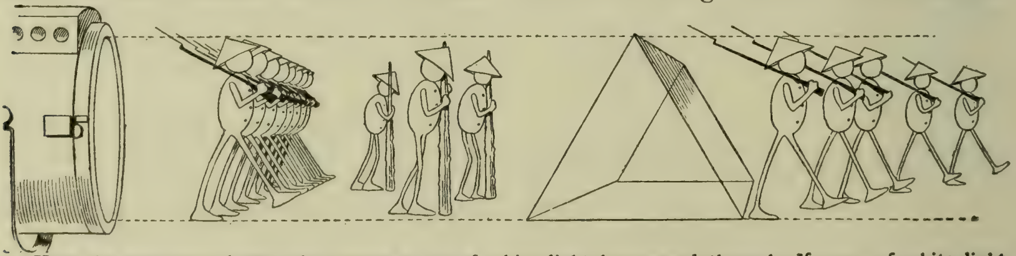
Figure 1 represents what happens to a ray of light when it enters a drop of water at the proper angle. It enters from above, is slightly bent, then totally reflected at the far side of the drop, and then leaves the drop just below the point of entry, bending again as it passes out, producing dispersion. Rays of light that enter the lower part of the drop are refracted twice, and totally reflected twice (Fig. 2). These latter rays create what is known as the secondary bow, which lies outside the primary bow. The secondary bow is always dimmer than the primary since the light passing through it is twice reflected, there being a loss at each of the so-called "total" reflections.

In the primary bow the light from the violet drop must enter the eye of the observer at an angle of 40 deg. to the line drawn from the eye of the observer to the sun, as shown in Fig. 3. The light from the red drop must enter at an angle of 42 deg. Similarly, in the secondary bow, the angle for the red must be 51 deg., while the violet must be 54 deg.

It is quite evident "that those drops whose direction from the eye makes any particular angle with the line drawn from the eye to the sun, must lie on a circle whose center is on that line. Hence we see a circular arc of light which is violet on the inner edge, and red on the outer edge in the primary bow, and red on the inner edge and violet on the outer edge in the secondary bow."

The rainbow shimmering high in the heavens is more than a mere arch of glowing colors. It is a royal ambassador from the kingdom of nature, a herald bearing a message of vast importance to mankind. Written upon its brilliantly hued, shining archway, is a truth that man has finally appreciated after the countless ages that have passed since the first rainbow glorified the heavens. And this truth is what? Nothing less than the revelation of the component elements that constitute the sun and stars and the dim-shining nebulæ lost in the farthermost hiding places of the universe. By means of this truth, written large upon the raindrops, we know more about the composition of the sun, 93,000,000 miles from the earth, than we do about the world on which we dwell. Let us review our knowledge of this wonderful property of light. It is not hard to understand.

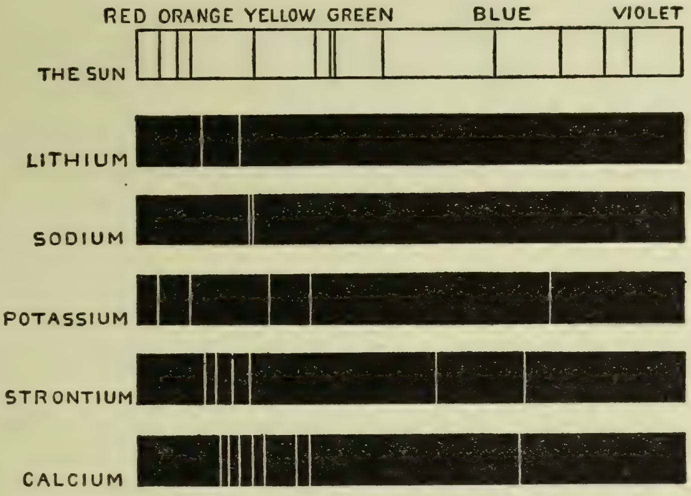
Just one hundred and thirty years after Newton's famous experiment, in other words in the year 1802, Doctor Wollaston, an English philosopher, discovered, on repeating Newton's experiment with the prism, a peculiar difference in the spectrum when the light was allowed to enter the prism through a narrow slit, instead of a round hole. The spectrum appeared to be no longer continuous, but was broken, here and there, by numerous dark, threadlike lines extending across it in a direction



How the spectrum shows what gases a ray of white light has passed through. If a ray of white light, indicated by the line of little soldiers, passes through some glowing gaseous element, some of the brotherhood are killed. Then when the line of soldiers passes the prism and is thrown into a curved front—the spectrum—it is immediately noticeable which are missing. The scientist knows just what gases would account for the killing of any little soldier.

parallel to the ends of the prism. Newton had not observed this phenomenon although he, too, had used a slit in his further experiments in dispersion. Considerable attention was attracted to this curious discovery, but no one understood its wonderful significance. In 1815, Fraunhofer, an optician of Munich, studied these lines with extreme care. He mapped no less than 700 of them, designating eight of the most conspicuous by letters of the alphabet. These positions follow:

A — Beginning of Red
B — Middle of Red
C — Beginning of Orange
D — Middle of Yellow
E — Middle of Green
F — Beginning of Blue
G — Middle of Indigo
H — Middle of Violet



Fraunhofer's Lines, in a Spectrum, Showing Location of Lines Which Indicate the Ray of Light Passed through the Elements Named

What is the meaning of these Fraunhofer's lines? What is their cause? Evidently something happens to sunlight when it passes through a prism, that does not happen to the light from a candle or lamp when it is treated in the same manner. A candle, lamp, or arc light will produce a continuous spectrum, without any sign of a dark line. What becomes of the lost sunlight that properly belongs where the dark lines appear? Let us perform a simple experiment that will put us in the way of finding out the truth. If light from an alcohol lamp whose wick is strongly impregnated with common salt is passed through a prism, an intensely bright line, yellow in color, will be its spectrum. Now, if sunlight is passed through a prism and its spectrum thrown directly above or below the spectrum from the burning salt, so that the two spectra may be compared, it will be found that exactly opposite the bright yellow line produced by the salt, or sodium spectrum as it is termed, a dark line appears in the sunlight spectrum. This is the "D" line in Fraunhofer's classification, and is really a number of lines very close together. This "D" line is therefore a bright line in the sodium spectrum, and a dark line in the sunlight spectrum. Now, if this "D" line is due to sodium, it is evident that the sodium light has been taken out of the sunlight, in some way or other. Let us go on with our experimentation. Suppose we pass a beam of strong, white light from an arc lamp through a prism and thus obtain a continuous spectrum. Then let us interpose between the arc light and the prism, a glass tube or other transparent holder, containing the highly heated vapor of metallic sodium. Instantly a dark line appears in the very place where the bright yellow line appeared in our first experiment with the alcohol and salt. The sodium vapor has absorbed or quenched precisely those rays which the vapor itself gives out when it is glowing. And now, since the sunlight was robbed of this same yellow line, does it not follow that the light from the sun must have passed through a glowing vapor which contained sodium? Is it not reasonable for us then to believe that sodium exists in the sun's atmosphere?

By the same reasoning we are able to demonstrate the presence of many other elements in the sun. Iron, for example, gives 460 bright lines when its spectrum is viewed through a good spectroscope. Every one of these bright lines is exactly matched by dark lines in the sun's spectrum. This could not be accidental. There must be iron in the sun's atmosphere.

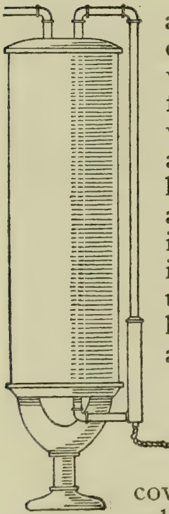
Upward of 2,000 lines have been measured and defined in the sun's spectrum, and many of them have been identified with terrestrial elements. We are certain that iron, sodium, nickel, calcium, hydrogen, chromium, copper, and barium exist in the sun's atmosphere—just as certain as we are that they exist in the earth's crust. Gold and silver have not yet been discovered in the sun, but they may exist there, even though their lines have not yet been identified. Helium, on the other hand, was first discovered in the sun's atmosphere, and afterward Ramsay proved its presence in the earth's crust.

It is a comparatively simple matter, therefore, to determine the composition of a sun, star, or nebula. Even a comet and "shooting star" have been made to tell their story. The light from them is passed through a good spectroscope, the number and position of the dark lines or bright lines noted, and then these lines are compared with the lines of known substances, just as one would match ribbons in a draper's shop.

The presence in the photosphere of the sun of upward of 40 different elements has been determined. The stars, that from the beginning of time had refused to answer all questions, have gracefully yielded up the secrets of their composition, and man has advanced thereby one step nearer to the solution of the mystery of his environment.

And all this wonderful story of the spectrum had been emblazoned upon the sky each time the "magic of the rainbow" glorified the heavens, but man was slow to understand.

DOMESTIC HOT-WATER TANKS HEATED BY ELECTRICITY



A small family in Niagara Falls doing all its cooking by electricity wished to use the current for heating the necessary water for the household as well, and the electric-light company, in making arrangements for such an installation, decided that it would be practical to use the ordinary domestic hot-water boiler or tank already installed. A 750-watt heating unit was inserted in the feed pipe, and the tank was completely covered with a coating of asbestos, 2 to 3 in. thick, to prevent radiation of heat.

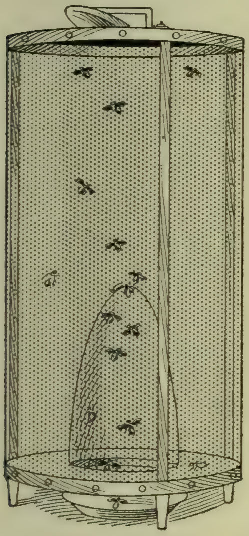
The arrangement in the house produced such excellent results that a similar installation was made in a barber shop which was temporarily without a hot-water supply, the hotel in which it was located being closed for the winter. In this case two 750-watt heating units were introduced into the water system.

THE SMOOTH RUNNING OF ENGLISH TRAINS

Money sticks in some pockets and in some hands, but it is doubtful if money could stick long on one of the steps of a fast-moving American passenger train. Indeed, it would in all likelihood be dislodged a few moments after the train started. Yet two instances of coins being dropped upon the footboards of Great Western passenger expresses in England are given as examples of the smooth running of that road.

Both instances relate to the recovery of coins dropped upon the footboards of trains at the moment of departure. In one, a ticket collector dropped half a soverign ($2.50) on the footboard of a train running from Paddington station, London, to Birmingham. The train started away before he was able to pick it up, but the coin was still in position when the train reached Birmingham two hours later. Another coin was similarly recovered when one of the fast trains stopped at Reading after a speedy run from London.

OUT-OF-DOOR TRAP FOR FLIES



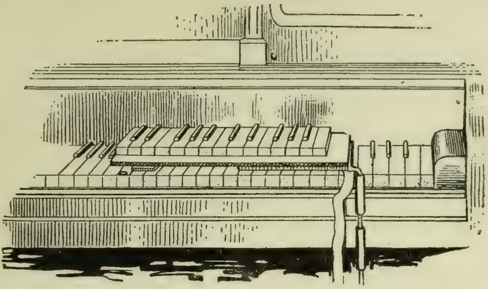
The large-sized fly trap here shown is designed to catch flies outdoors, and particularly for service in places near garbage cans, stables, meat markets, grocery stores, and the like. The trap is 26 in. high and 11½ in. in diameter. Some suitable substance, such as a mixture of sugar, water and vinegar, is placed in the dish under the trap, and the flies, after feasting, naturally fly upward, land on the wire dome, and then crawl upward to escape but instead find themselves caught in the trap proper.

URGED TO TAKE EXPLOSIVES FROM THE AIR

At a recent meeting of the executive committee of the British Science Guild in London an appeal was formulated to urge the British government to take steps to produce explosives from the air, regardless of financial considerations. It was pointed out that explosives were being largely manufactured on the Continent from atmospheric nitrogen, and that England should do likewise, as the sources abroad from which England obtains the raw material for explosives might be cut off in the event of war.

MUSICAL-BELL ATTACHMENT FOR PIANOS

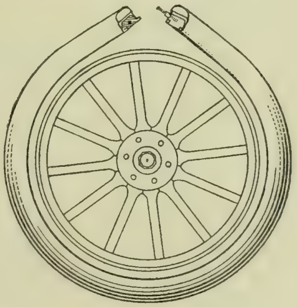
A piano attachment for musical electric bells, designed particularly for motion-picture theaters and similar places where only a pianist is employed, is just being marketed by a Wisconsin manufacturer. A small keyboard swings into position as shown in the drawing, and by means of it the pianist can operate the musical bells, playing loudly or softly as desired.



An Arrangement by Means of Which the Pianist may Play Musical Electric Bells

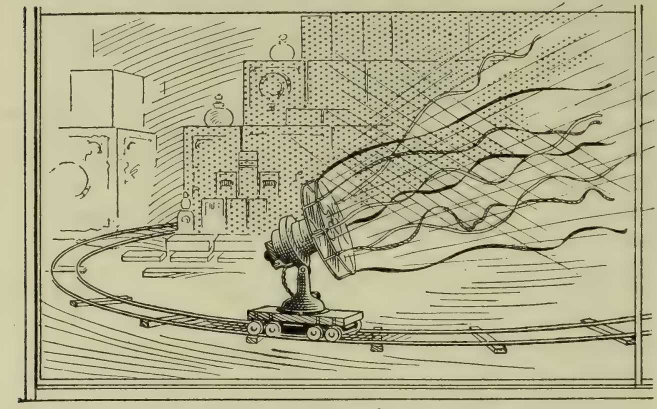
SOLID RUBBER TIRE FOR EMERGENCY

An easily attached solid rubber tire, designed to be used in the place of a pneumatic tire in emergencies, is being marketed by an American concern. It is so flexible as to be easily rolled up for storage in a small space, and, upon damage occurring to a hollow tire, can be quickly clamped on over the rim in its place. It is claimed that with but one regular tire removed, the use of the hard rubber tire in its place will scarcely be noticed, so far as any difference in the comfort of riding is concerned.



AN ELECTRIC FAN WHICH RUNS AROUND A TRACK

The proprietor of a small store in Chicago has devised a novel show-window display of the "action" variety with a simple electric fan, a circular track of the type used for the operation of toy trains, and a little truck. The rails of the track are connected into an electrical circuit, which is completed by passing the current from one rail through the truck to the motor of the fan, which is set on the truck, and back to the other rail.



Electric Fan on Wheels Propels Tiny Car on Tracks around a Store Window, Drawing Power through the Rails

The revolutions of the fan drive the truck around the track.

COWS SHELTER UNDER AN AEROPLANE

A rather unusual scene, incident to an aeroplane accident, was recently witnessed in England. Major Lyle, a pupil of Grahame White, fell with his machine, and although he escaped injury, the aeroplane was wrecked. It was raining at the time, and when the mechanics arrived a short time later to remove the wreck, they found a number of cows sheltering beneath it.

¶A former sea captain has invented a sea anchor for lifeboats that has an attachment to be filled with oil which can be poured upon the sea.

CONCRETE CHIMNEY OF INTERESTING DESIGN

A concrete chimney recently erected at a steel plant near Hamburg, Germany, has many interesting features besides its great height of 328 ft. Among these are its acid-resisting lining, made absolutely necessary because the purpose of the chimney is to carry away smelter-furnace gases; the special heat-resisting lining which extends from the top of the base to a height of 66 ft., and the massive nature of the chimney's base.

The chimney, which is round in shape, tapers from an outside diameter of 30 ft., at the base, to 11 ft., at the top, where the free opening is 9 ft. in diameter. Immediately below the chimney proper is an underground vault, 13 ft. in height, which serves as an inlet for the gases. This is octagonal in shape, 36 ft. in diameter, at the base, and 31 ft. in diameter, at the top, and rests on a concrete block, 7 ft. thick and 42 ft. in diameter, which is in turn supported by 237 wooden piles, the space around and between which is filled in with concrete.

The reinforcing of the chimney consists, in part, of forged-iron rings imbedded in the concrete at intervals of about 6 ft. throughout the entire height.

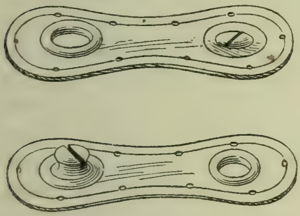
MOTION PICTURES SHOWN ON ELECTRIC PARTY CAR

The new "party car" of an electric interurban railway running out of Pittsburgh, designed especially for theater and other parties who wish a private car, has been equipped with a motion-picture machine, which is operated while the car is making its trip. With the electric lights in the car turned off and the window curtains pulled down, the car becomes a cozy little motion-picture theater on wheels.

When it happens that a party is so large as to require two special cars, half the party occupies the motion-picture car on the outward run, and the other half on the return journey, thus giving the entire party an opportunity to enjoy the pictures.

AN INVENTION FOR THE ASSISTANCE OF MAN

Sets of so-called "twin buttons," designed to take the place of hooks-and-eyes, and safety pins, is a recent French invention, which, according to a French magazine, should appeal to women and men alike, and especially to such of the latter who have had "prolonged" experience in hooking a woman's dress up the back.

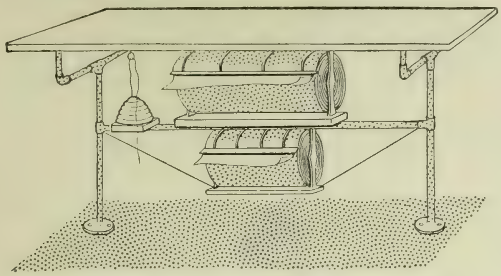


The invention consists of two small pieces of celluloid, provided with holes for conveniently sewing them to a garment, each piece having a snap button and an eye at opposite ends. The sets are attached in such position that the button of each piece engages the eye of the other. They are pressed together in the same way as a glove snap.

The sets are provided in various colors, so that they may be almost invisible when used with thin dress goods of similar colors.

HOMEMADE WRAPPING-PAPER STAND

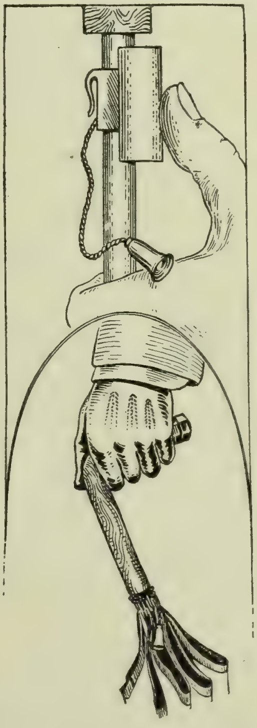
A homemade wrapping-paper stand constructed by the proprietor of a hardware store in Sioux Falls, S. D., when it was found that the necessary shelf space could not be given up for wrapping, is shown in the accompanying drawing. The frame of the stand is made of 1¼-in. gas pipe, the top, 3 ft. long by 2 ft. wide, being 3 ft. above the floor. The upper paper-rack brackets are fastened underneath the top by screws, while the smaller rack is bolted to the cross or tie-rod of the frame, the twine holder being mounted on this cross rod at one end.



A Practical Homemade Wrapping-Paper Stand

RIB GRIP FOR UMBRELLAS

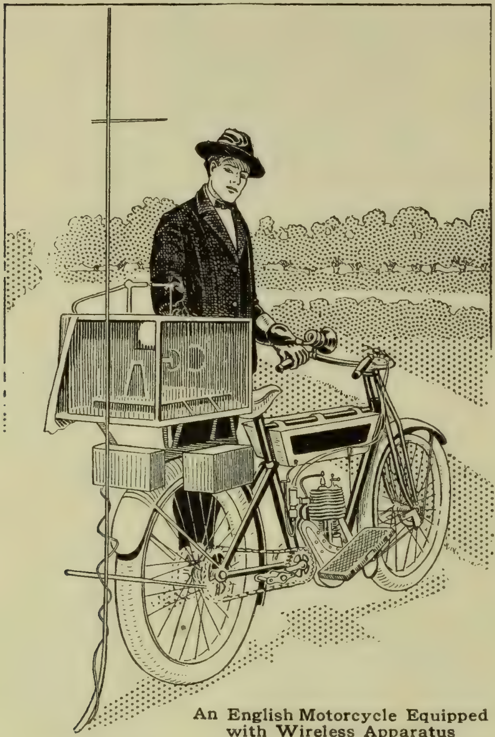
A handy little rib grip for umbrellas is now being manufactured. It snaps onto the umbrella rod instantly, and then the cord attached to it is passed around the rib ends and caught under the hook. It is a practical little device also for a new umbrella, and its usefulness is particularly marked on an umbrella which has had its regular rib-fastening tab torn off during long service.



ℭAmong the old ships the Navy Department has on the sales list this year is the "Yankee," the hulk of which lies in Buzzard's Bay, Mass., the sum of $2,010 having been bid for it, at which figure it will probably be sold.

MOTORCYCLE EQUIPPED WITH WIRELESS

A resident of Nottingham, Eng., who has an enthusiasm for both motorcycling and wireless telegraphy, has equipped his machine with a wireless outfit which does not in any way interfere with the former's operation. The apparatus is mounted on a rack over the rear wheel. The operator, who is G. F. Champion, has succeeded in receiving messages while traveling at a high rate of speed.


An English Motorcycle Equipped with Wireless Apparatus

ORIGIN OF "HORSEPOWER" AS A POWER UNIT

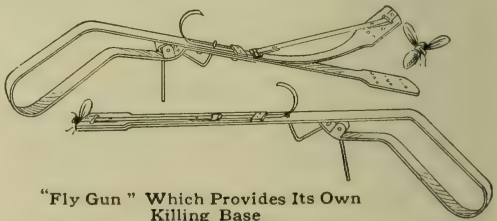
The multitude of automobiles, motors and power-machinery of all kinds in our days has caused the word horsepower to become part of the daily vocabulary of almost everybody. Nearly as well-known is perhaps the fact that James Watt, the father of the modern steam engine, was the first to measure power by this unit and to establish its value. But the reason why he happened to consider the work performed by a horse as a power unit instead of some other arbitrary value may not be generally known.

The fact is that one of his first orders for a steam engine was given him by a brewer, with the specification that the engine should be capable of pumping daily at least as much water from a well into the brewery as a horse, the power previously used.

A price was agreed upon and the quantity of water to be delivered had to be fixed. The brewer, a canny Scot, put his strongest horse to work for eight hours, driving him all the time to the limit of his endurance. Thus the horse in that time pumped up so much water, that it, with due consideration of the depth of the well, corresponded on an average to the lifting of a weight of some 30,000 lb. to a height of one foot in one minute. This exceeds by nearly one-third, the work capacity of the average horse, but Watt, knowing with whom he was dealing and desirous to more than fulfill the specifications of the contract, so calculated the engine that it would safely perform 33,000 foot-pounds of work in one minute; and henceforth used this unit, which was called, first in England and then all over the world, horsepower, for measuring the work or power of an engine.

AN INTERESTING FLY-KILLING "GUN"

Although not quite so proficient in number of executions as the "swat-the-fly" type of fly killer, this little English device, called a fly gun, is of particular usefulness in certain conditions. It is true that it must be quickly

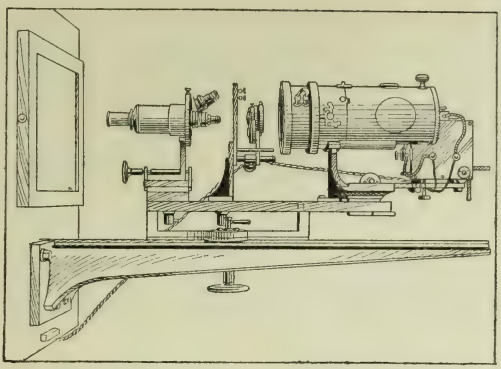

"Fly Gun" Which Provides Its Own Killing Base

brought into a fairly exact position in order to kill, while it is only necessary to "swat" with the swatting type of killer, but, on the other hand, the fly gun is provided with its own killing base, which saves the wallpaper, tablecloth or window pane from most of the "spatter" incident to the slaughter.

The upper part or flap of the fly gun is drawn up by a spring, and the pulling of a trigger allows it to descend upon the bottom plate with rapidity and force. The flaps or plates are perforated to prevent air disturbance during the operation.

INGENIOUS PROJECTING MICROSCOPE

A clever projecting microscope, called a projectomicroscope, has recently been installed in St. Bartholomew's Hospital, London, where it is proving of the greatest assistance to the student in the course of his studies. The apparatus consists of an inverted high-power microscope arranged in connection with a powerful arc light. By its use an enlarged image of the specimen under study is projected on a white screen.

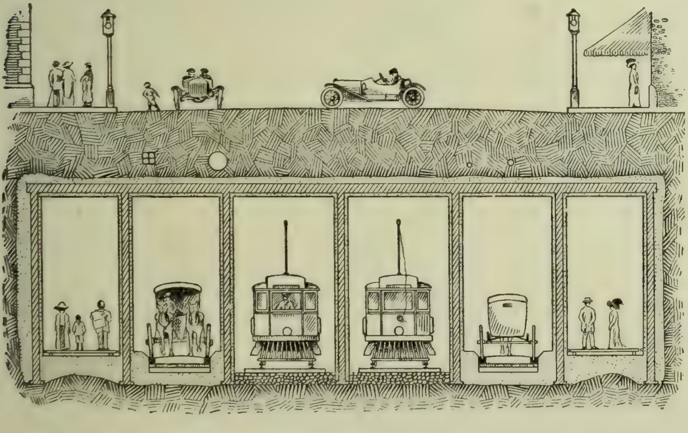


This Projecting Microscope Throws an Enlarged Image on a White Screen

ℭOrders have been issued to place the revenue-cutter service on an efficient war footing and to this end the various ships will be equipped with modern six-pounders and will hold regular target practice.

HIGHWAY TUNNEL PROPOSED FOR SAN FRANCISCO

The Devisadero Street Improvement Association of San Francisco has been agitating the construction of a highway tunnel under that street to connect the districts known as the "Happy Valley" and "Harbor Hill." The subway proper would be 2,950 ft. in length, and the approaches 2,390 ft. The Panama-Pacific Exposition tract is just one and one-half blocks beyond the north end of the proposed tunnel, so that the project, if carried through, would greatly improve the exposition transportation facilities.

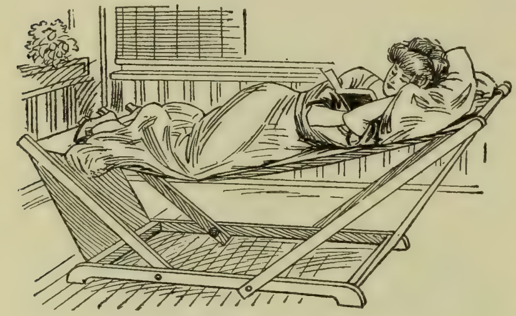


Plan of a Proposed Highway Tunnel Connecting Two Sections of San Francisco

In the tunnel plan a separate section is provided for each kind of traffic in either direction, the footways being provided with moving sidewalks. The vehicle sections would be paved with wooden blocks to give horses a good foothold and with steel ways for vehicle wheels. The footways would be each 8 ft. wide, the wagon ways 9 ft., and the street-car sections 10 ft. The tunnel would be built on a rather steep grade, giving a difference in elevation of 130 ft. between the two ends.

COUCH HAMMOCK FOR PORCH OR GARDEN

A couch hammock, having no wires, ropes, pegs or posts to fix, and designed for the garden or porch, is shown in the accompanying drawing. It folds flat when not in use, and opens as simply as a folding chair. The head can be either raised to form a lounge or lowered to form a bed.



A Simple Folding Couch Hammock

LOCUSTS MENACE SPANISH AIRMAN

While flying at the Bajo aerodrome, near Madrid, an airman named Jean Mauvaise flew into a cloud of locusts which nearly caused his death. With the mild winter and spring at 96 deg. F., in the shade, locusts have become prevalent in Spain, and when at a height of 60 ft., the aviator met an invasion of these insects in the air, causing the aeroplane to fall. Mauvaise is said to have had a miraculous escape, but his machine was wrecked.

FRANCE AIMS BLOW AT ADVERTISING SIGNS

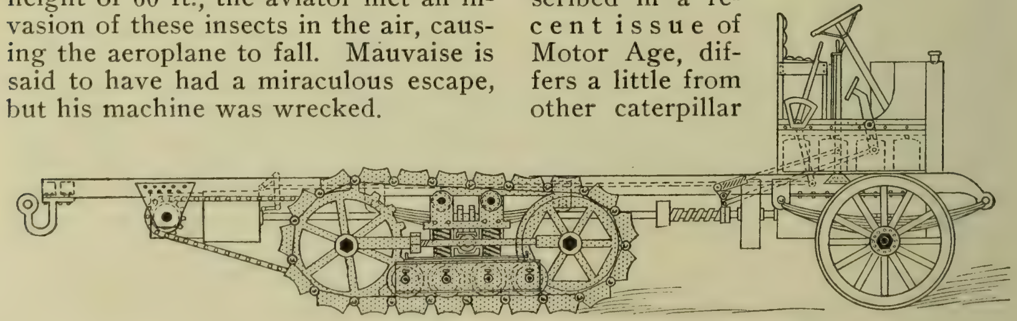
The French government has inaugurated a scheme for the suppression of advertising signs which does not depend upon prohibitive legislation, but prohibitive rentals.

During the past two years billboard advertising has become so popular near Paris that it is now difficult to obtain an uninterrupted glimpse of country on any of the roads leading out of the city. Only a small tax has been levied on such boards in the past, but the government has now increased the tax to a figure which is expected to prove prohibitive. In the future a little more than $3 will be charged per square foot on boards of less than 18 ft. square, $13 per square foot for boards of from 30 to 60 ft. square, and $18 per square foot for boards of still larger size. This tax is to be doubled if the board contains two advertisements, trebled if there are three, and so on.

CATERPILLAR-DRIVE ARMY TRUCK

The caterpillar form of automobile, which has been described in this magazine several times, and in which the machine virtually lays its own track as it moves along and then runs over it, is recommended by Lieut. B. F. Miller, U. S. A., as the type of service truck most nearly approaching the requirements of the army.

The recommended type of machine, however, as described in a recent issue of Motor Age, differs a little from other caterpillar

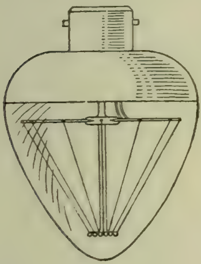


Caterpillar Truck Suggested by Lieutenant Miller, U. S. A., as Ideal for Military Service vehicles in that it is provided with an ordinary set of wheels in front. The arrangement is such, however, that the steel-rimmed front wheels are intended simply for steering and for carrying the weight of the engine, which is located over them. The transmission is located back of the rear axle.

LEAD-COATED STEEL FOR ROOFING

A new type of metal roofing, consisting of sheet steel, coated with pure lead, is claimed to have many advantages over other similar types of roofing. Among the claims set forth are, that it is not subject to cracking or flaking; that it is not readily susceptible to chemical influences, and that it will not resist painting as does a zinc surface. It can be painted without the use of acids, may be easily soldered, and is not liable to rust.

NEW FORM OF METAL LAMP FILAMENTS

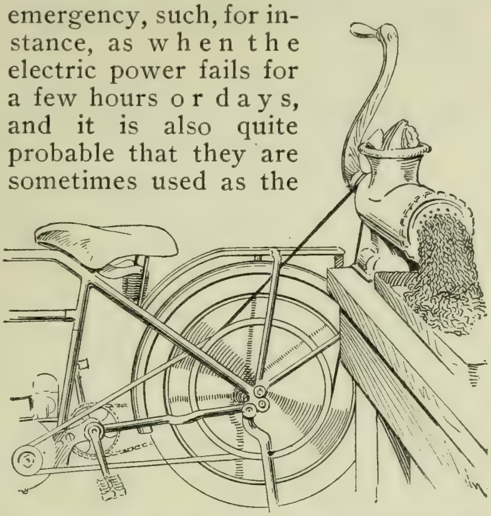


With a view to obtaining a better natural downward distribution of light than is possible in the ordinary metal-filament electric lamps, without the use of shades or reflectors, a European inventor is constructing lamps in which the filaments form the envelope of an inverted cone. The results of comparative tests between the new type of lamp and one in which the filaments were of the ordinary cylindrical shape is claimed to have shown a 20-per-cent superiority for the conical form.

ℭThe submarine boat "Seal" in a government test was submerged to a depth of 256 ft. and remained at this depth for a period of 31 min., rising promptly to the surface at the end of that time.

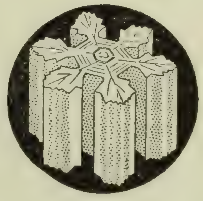
MEAT CHOPPER OPERATED BY MOTORCYCLE

Motorcycles have often been harnessed to small machines in times of emergency, such, for instance, as when the electric power fails for a few hours or days, and it is also quite probable that they are sometimes used as the regular power plant for such machines. An instance of regular instead of just emergency installation of a motorcycle as a power producer is here illustrated. The proprietor of a butcher shop in Chicago has been using his motorcycle for the past year to operate a meat-chopping machine. He also uses the motorcycle for business trips about the city and suburbs, and finds that the arrangement cuts down his operating expenses materially.



Motorcycle Harnessed to a Meat-Chopping Machine

AN UNUSUAL ICE CRYSTAL

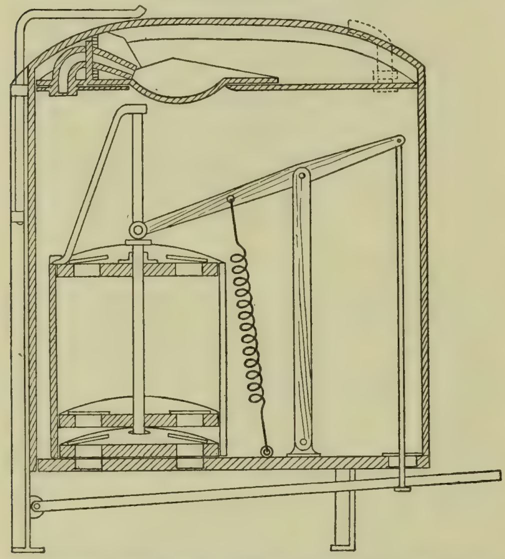


An unusual, if not unique, snow or ice crystal (not to be confused with a snow flake) was found by a correspondent to the French scientific magazine La Nature, during a trip through the Pyrenees. Its peculiarity is not in the shape, which is the regular hexagonal of all such crystals, but in the exceptional thickness, which exceeded half the diameter of its surface. An ordinary ice crystal is so extremely thin that it melts instantly on being touched by a finger.

The unusual crystal was found at an altitude of about 5,000 ft., the temperature at the time varying between 23 and 27 deg. F.

CYLINDER-BLAST FORGE OF PORTABLE TYPE

A portable forge with a blast produced by a piston operating in a cylinder has been patented by an English inventor, who claims that the large volume of air thus compressed in the reservoir makes the blast much more even than in forges operated by bellows only. Within the body of the forge, which is the compressed-air reservoir, is the compressing cylinder and piston. When the pedal is pressed downward by the foot of the operator the piston in the cylinder is raised, causing air to be sucked in through flap valves in the bottom. When the pressure on the pedal is released, the spring draws the piston back to the bottom of the cylinder again, and continuation of the operation causes a pressure to be set up within the reservoir.



A Portable Forge with a Blast Produced by a Piston Working in a Cylinder

AUTOMATIC ELECTRIC MINE LOCOMOTIVES

An electric storage-battery locomotive, entirely automatic in operation, has been in use for some time in a German coal mine and is said to have given excellent results as to simplicity, economy of operation, and safety.

The most interesting feature of the installation is the device which almost instantly stops the locomotive when an obstacle on the track is encountered. This device consists of a wooden frame mounted on the front of the locomotive in such position that it will come in contact with any object lying on the track. When the frame strikes an obstacle, such as a man, for instance, the frame slides backward, breaks the electric circuit and causes the brakes to be applied, thus bringing the locomotive to a quick stop. When the obstacle is removed, the frame is forced forward again by a spring mechanism, the brakes are released, the circuit closed, and the locomotive moves on again. The frame is removable and can be mounted at the rear when the locomotive is running in the opposite direction.

The switching of the locomotive is also automatic, and is accomplished by means of rings attached to brackets mounted on the front. Each switch lever is provided with a crossbar which will engage with the ring carried by a certain bracket. If the ring is not on the bracket, the particular switch it serves is passed over without being actuated; but if the ring is in position, the crossbar is engaged and the switch thrown.

The locomotive weighs 2½ tons, and travels at a rate of about 2¼ miles an hour.

¶The greatest depth of the sea that has yet been measured was reported by the survey ship "Planet" to be at a point 40 miles off the northern coast of the Island of Mindanao, one of the Philippine group, where a depth of 32,089 ft. was registered.

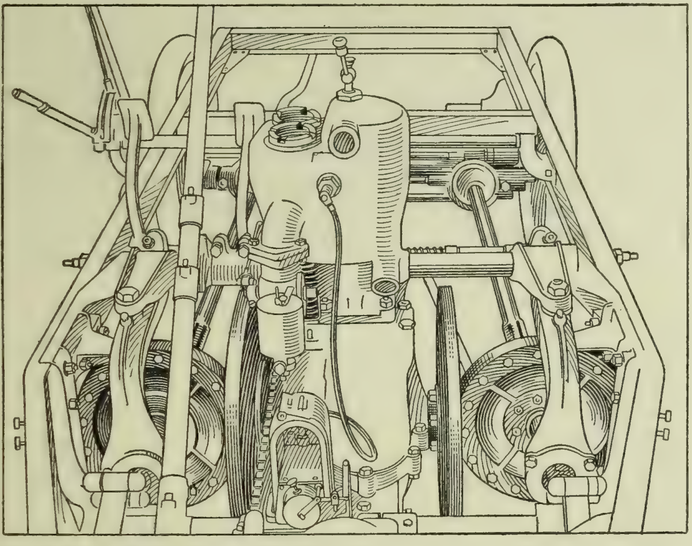
THE PROPOSITION TO CERTIFY OYSTERS

All the oyster fisheries in this country have been urged by Dr. W. T. Sedgwick, of the Massachusetts Institute of Technology, to work for an arrangement by which all oysters would be "certified," the certification to be made by a board of health or other authority.

According to this plan there would be three grades of oysters, only oysters in the shell being in the first grade. The second grade of oysters, although not of the highest quality, could be eaten raw as well as cooked, and the third grade, although fairly suitable for food, however prepared, should be marked "for use only when cooked."

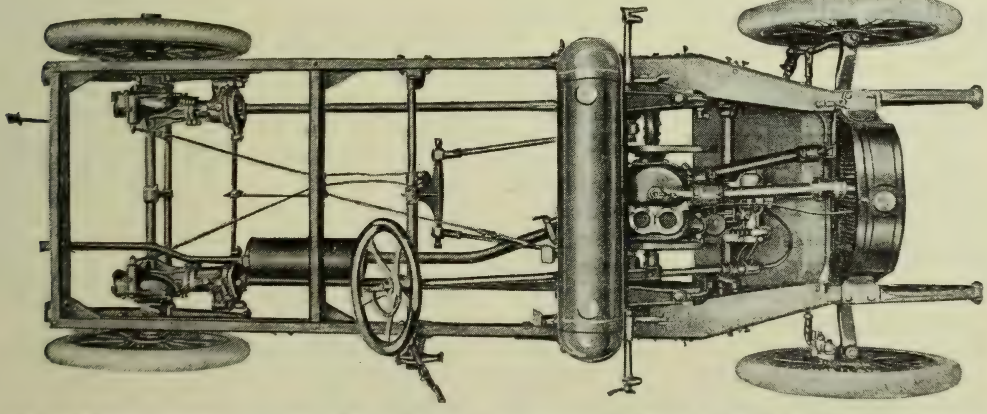
¶The "Lusitania" and "Mauretania" now have two captains each, one being a "staff captain" who relieves the captain-in-chief of much of his work without further burdening the first officer or mate.

NEW IDEA FOR MAKING CHEAP AUTOMOBILE



Front View of the Power Plant of New Automobile, Showing the Two Flywheels, with the Friction Disks Pressing against Them

A very clever innovation in automobile design, for the purpose of creating a type capable of being built at exceedingly low cost, is being tried in France. The essential novelty in this car is best shown in the top view of the chassis, in which it is seen that the final drive is by two propeller shafts extending to two bevel-gear pairs on extensions of the rear-wheel hubs. The forward ends of the propeller

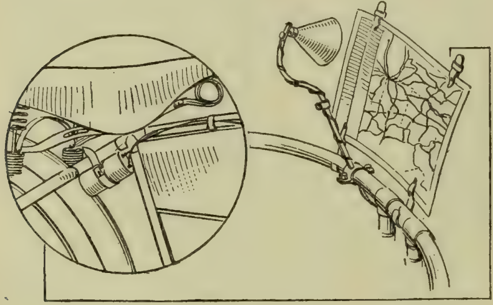


Top View of New Cheap Automobile, Showing the Separate Propeller Shafts for Each Rear Wheel Which are Driven by Friction Disks Pressing against the Two Flywheels shafts are directly driven by friction disks that press against the smooth surfaces of the two flywheels, one on each side of the one-cylinder vertical engine.

All changes of speed, as well as the reverse, are readily produced by sliding the friction disks forward or backward by a simple controlling device.

ILLUMINATED ROUTE CARD FOR MOTORCYCLES

After all, it is at night that the route card is most necessary and valuable to the motorist and motorcyclist, and the night use of such guides requires illumination. At the start of a recent motorcycle run from London to Edinburgh several interesting fittings were to be seen on some of the machines, and among them was a route-card holder mounted on the handlebars, and a neat little electric lamp so mounted as to illuminate the card. A small dry battery under the seat supplied the current.



Route-Card Illumination on a Motorcycle

UNCONNECTED ELECTRIC WIRES GIVE SHOCK

A group of telegraph wires on the railway station of Clichy-Levalois, at the gates of Paris, gave severe shocks to a number of electricians who touched them, although these wires were not yet connected with any system.

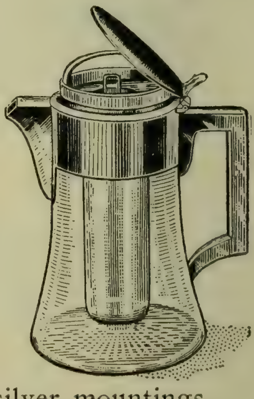
The phenomenon was so strange that the matter was reported, and the subsequent investigation revealed the startling fact that the shocks were due to Hertzian waves sent out from the powerful wireless station at the Eiffel Tower. A receiving station was then established by way of a test, and the wireless messages dispatched from the tower and other stations were intercepted. This proved that the group of wires, through pure hazard, filled all the conditions of height, distance and position necessary to receive the Eiffel Tower's communications. This was considered particularly interesting because a wireless tower erected on the roof of a normal school in the vicinity had never succeeded in intercepting these messages.

NUMBERING OF FARM HOUSES SUGGESTED

If the plan of the Automobile Club of Kenosha, Wis., is worked out as expected, all the country roads in the vicinity will be named and blocked off in distances of certain length; and every farmhouse or farm will be given a number. These names, numbers and distances will be made available by the publishing of a guide map. Automobile and other vehicle travel in Kenosha County will thus be greatly facilitated and it will be as easy to find a farmhouse as it now is to find a city residence.

CHAMPAGNE JUG WITH ICE CHAMBER

Champagne cooled in a jug or pitcher, instead of inserting the bottle in a bucket of ice, is one of the numerous articles advertised as suitable for wedding gifts by a large London shop. The ice is contained in a central chamber, and the jug is of crystal glass ornamented with silver mountings.



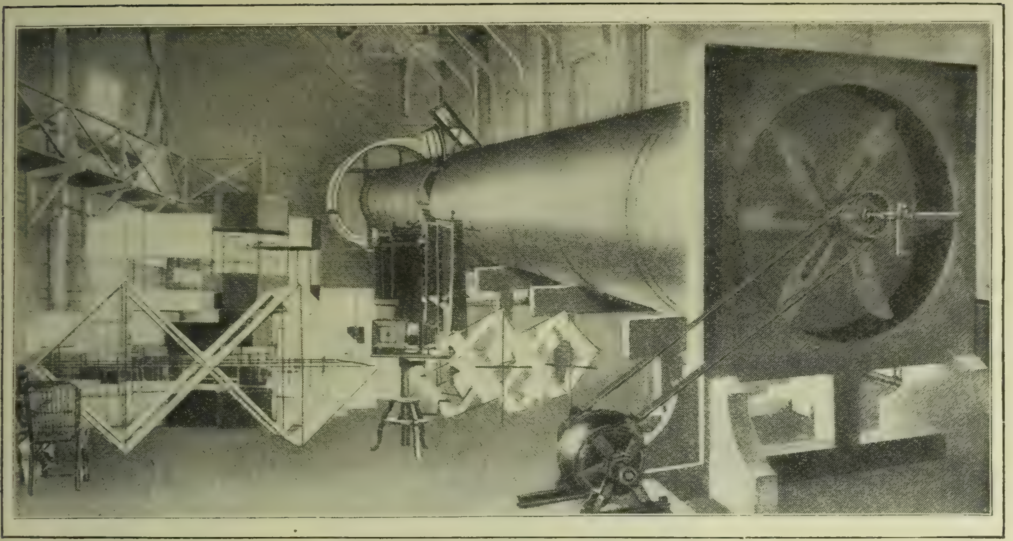


Fig. 1 — Wind Tunnel of the Aerodynamic Institute at Koutchino, Russia

EUROPEAN AERONAUTICAL LABORATORIES

By DR. A. F. ZAHM

Chairman of the Aerodynamic Committee of the Aero Club of America

There is in America a strong and general sentiment favoring the establishment of a national aeronautic institute commensurate with the best in Europe. For it is noted that exhibition and prize flying, however munificently rewarded, have but disclosed the limitations of our aeroplanes, not the science of perfecting them. The cut and try, the rough pioneer work, has been cleverly performed by our chief aero inventors, and is practically terminated.

The art of mechanical flight has now to be placed on a rational, an exact, an engineering basis, through investigation of the correct principles of design, and by rigorous tests of actual machines and their accessories. These ends can be attained best in institutions specifically arranged for the purpose, and adequately endowed. We have, in fact, either to resume in America the kind of investigations abandoned by Dr. Langley, for want of funds, or borrow from other nations their exact science of aeronautical engineering. The feeble and fortuitous experiments of our amateurs, pottering in poor laboratories, can not keep us abreast of the more enterprising countries. We may therefore with profit glance at the chief foreign establishments for an intimation of what is needed at home.

The institute here contemplated is primarily for producing rather than teaching aeronautical science. Schools of aviation are already training aviators; courses of aeronautical engineering, though popular in Europe, are at present not greatly needed in America.

In Europe two kinds of aeronautical-research institutions are in active operation; the one kind privately endowed and managed in the interest of science and the art of construction; the other kind supported by governmental appropriation, and conducted largely in the interest of the military service, though frequently publishing valuable data which may be available to the world at large. We may devote our attention at present to the private and civil institutions, since their status and operation have been more fully made public.

Near Moscow, in Russia, is the celebrated Institut Aerodynamique de Koutchino, under the directorship of

D. Riabouchinski, established by him in 1904 at a cost of 100,000 roubles and provided with an annual income of 36,000 roubles, or about $18,000. This laboratory is intimately coördinated with the University of Moscow, and is devoted to the greatest variety of investigations in pure and applied aerodynamics, meteorology and aeronautics generally.

The personnel of the institute comprises a group of competent scientific men and skilled mechanics. Dr. Riabouchinski, a patron of aeronautics both wealthy and versed in the science, is the leading spirit. With him is directly associated Mr. Kousnetsov, assistant director. There is a business manager, an assistant manager, a computer and a librarian. Prof. Joukovski, of the University of Moscow, an honorary member of the above scientific staff, agreed to make a theoretical study of a part of the experiments, and his students were encouraged to conduct researches in the laboratory at Koutchino. In the workshops are nine skilled mechanics and six laborers.

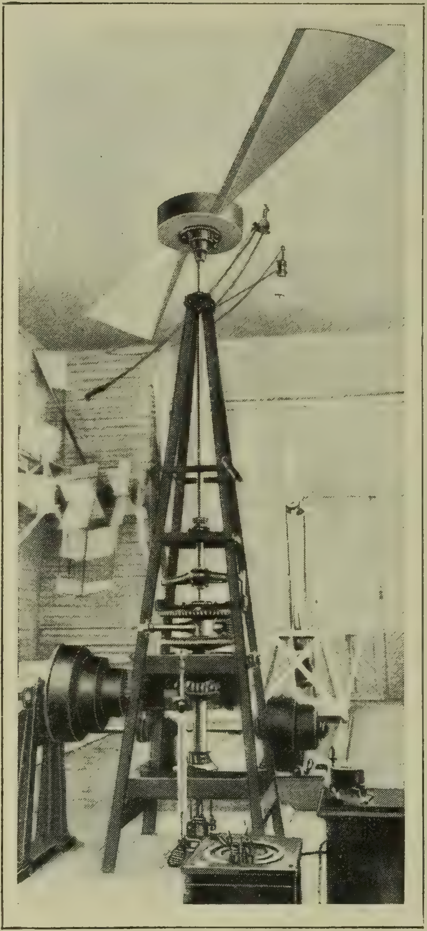


Fig. 2—Propeller-Testing Apparatus of the Aerodynamic Institute at Koutchino

The institute comprises four buildings surrounded by ample grounds in the open country. There is a commodious dwelling and office building for the technical staff, a dormitory for the workmen, a main laboratory and a power house. The main laboratory is a two-story building measuring about 50 by 115 ft., and having at one corner a tower 65 ft. high; it comprises an ample machine shop and carpenter shop well furnished with hand tools and power tools, various minor rooms, and a large two-story experimental room. This latter is equipped with a wind tunnel (Fig. 1) and sundry measuring apparatus mostly constructed at the institute. The power house is a one-story structure measuring about 35 by 60 ft.; it comprises a boiler, dynamo and engine room, an accumulator room, and a forge room.

The original program of investigations comprised three principal sections. The first section, devoted to studies of air resistance, included determinations of coëfficients of resistance of various shapes; determinations of the center of pressure on various models; determinations of the lift, tractive force and stability of models in flight, etc. The second section, devoted to practical applications of the laws of air resistance, included the construction and test of helicopters, kites and aeroplanes of various types; the lifting of loads, signaling and photographing by means of kites, etc. The third section was to be devoted to the scientific exploration of different strata of the atmosphere. The program has been carried out with great skill and care. The results are published in excellent form, from time to time, in the elegant bulletins of the institute.

In Germany a well equipped aerodynamical laboratory, endowed with an income of $7,000 per year, has been established at the University of Göttingen, and has been in practical operation for three or four years. It is under the direction of Prof. Prandtl, who holds the chair of aeronautics in the university. He is assisted by various private lecturers, and has as technical advisers men prominent in mathematical and physical science and engineering. The endowment was furnished primarily by private individuals, and has been supplemented by governmental appropriation. It may be remarked that the sum of $7,000 a year in Germany has the purchasing power of almost twice that amount in America.

The experimental laboratory of the Göttingen establishment, apart from the constructional and executive departments, is a one-story building, in size about 30 by 40 ft., comprising a wind tunnel and two rooms, one for desk work, the other for instrumental observations. The wind tunnel of the laboratory, consists of a continuous closed channel, two meters (6.56 ft.) square in cross section and as long as the building. Through this tunnel the air is forced in steady closed circulation by a screw ventilator about 6.5 ft. in diameter, actuated by an electric motor of 30 hp. A wind speed up to 10 meters (32.8 ft.) per second is thus available when the motor is running at half load.

In order to insure perfect uniformity of flow in the air stream all over its cross section, special guide and equalizer surfaces were devised. At each bend of the stream a number of turbine-like blades divert the air gently through 90 deg., thus obviating the whirlpools which would otherwise occur. On leaving the ventilator the vexed and turbulent stream passes through a sheet-metal "honeycomb" (Fig. 3), comprising 400 cells, each about 4 in. square by 20 in. long. Later it passes through a second "honeycomb," comprising 90,000 cells proportionately smaller in section and about half a foot in length. Thus ironed out, the air flows in a steady uniform horizontal, rectilinear current through that portion of the tunnel where models are to be inserted to have their resistance investigated.

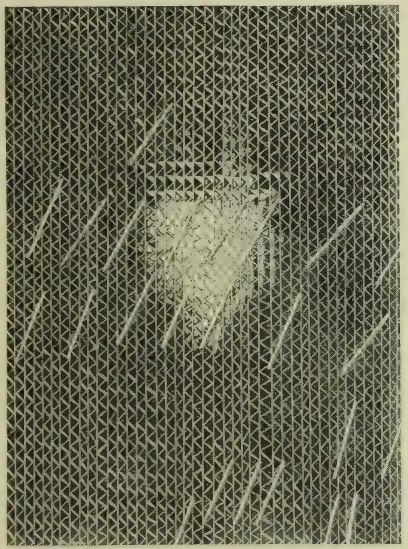


Fig 3—Honeycomb Sections of the Göttingen University Wind Tunnel, Which "Iron Out" the Wind, the Irregular Strips Correcting Inequalities

With this equipment the technical staff of the laboratory has made many important investigations. The lift and resistance of inclined-plane and arched plates have been measured at many angles of incidence, and with various ratios of length to breadth of surface. The effect of rounding and sharpening the front and rear edges of such plates also was studied. The vertical action of the aeroplane wake on the rear horizontal rudder was investigated. The resistance of wires, cords and ropes likewise has been measured at various wind speeds up to 10 meters (32.8 ft.) per second.

Perhaps the most interesting of the early researches in the Göttingen wind tunnel pertain to hull forms, or "balloon models," as they were called. Various torpedo-shaped copper shells, formed by electrodeposition, were suspended by fine wires in the uniform air blast, to determine their resistance. Then as successive holes in the shell from prow to poop were solitarily opened, the internal pressure of the shell was measured with a delicate gauge. Thus the external surface pressure at each hole became known. Summing the local pressures all over the model gave the entire resultant wind pressure, independently of the air friction along its surface. Subtracting the resultant wind pressure from the whole wind force on the model gave the resultant wind friction.

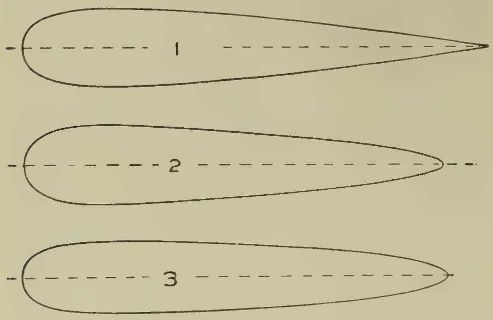


Fig. 4—Hulls of Easy Shape Tested in the Göttingen University Wind Tunnel

Of the models investigated, and shown in Figs. 4 and 5, the form of least resistance, for moderate wind speeds, is the whale-shape, No. 4. Next in order of efficiency are 6, 5, 1, 3, 2. The pressure at each point of a longitudinal line of model 6 is shown in Fig. 6, where positive wind pressures are indicated by distances above the axis of the figure, negative pressures, or suctions, by distances below that axis. As both prow and poop show positive pressures, the model is manifestly resisted in front and boosted behind. The suction exerts a propulsive effort before the major section, a retarding effort behind. The most efficient shape, 6, has at the higher speeds given about 1/18 the resistance of its major circle exposed squarely to the wind. In the interest of rapid transit, these researches should be extended to speeds exceeding 100 miles an hour.

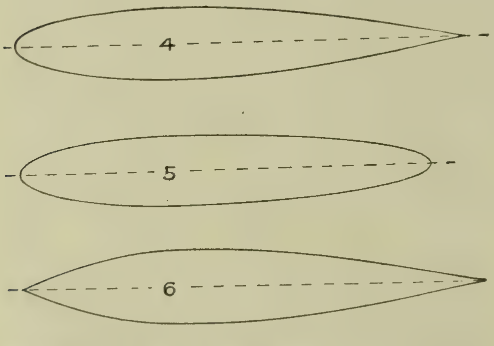


Fig. 5—Other Hulls of Easy Shape, No. 4 being the Shape of Least Resistance

In France, Mr. Basil Zaharon has given $140,000 to found a chair of aeronautics in the University of Paris, and Mr. Deutsch de la Meurthe has donated to the University the Institut Aerotechnique de Saint-Cyr, Fig. 7, near Versailles, founded at a cost of $100,000, and endowed by him with an income of $3,000 a year for maintenance. The establishment was ready to begin active operations in July, 1911. Its director is M. Maurain, Doctor of Science, and former professor in the faculty of sciences of Caen. He has on his advisory committee many of the most eminent scientific and aeronautical experts in France together with prominent representatives of the University of Paris, the Aero Club of France, and various civil and military departments of the government.

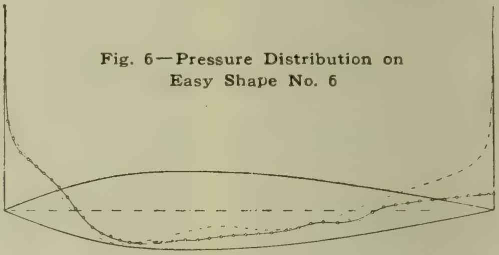


Fig. 6—Pressure Distribution on Easy Shape No. 6

The institute comprises nearly 20 acres of clear, dead-level land adjoining the maneuver ground of the government military school, at a convenient railway center a few miles from Paris. Some 12 acres are reserved for buildings; the rest forms a narrow strip 4,400 ft. long containing an electric road (Fig. 8) for transporting models at various speeds when studying their resistance in free air.

The first structure erected is the main building which measures over all some 260 ft. long by nearly 200 ft. wide. This has a main testing hall over 60 ft.

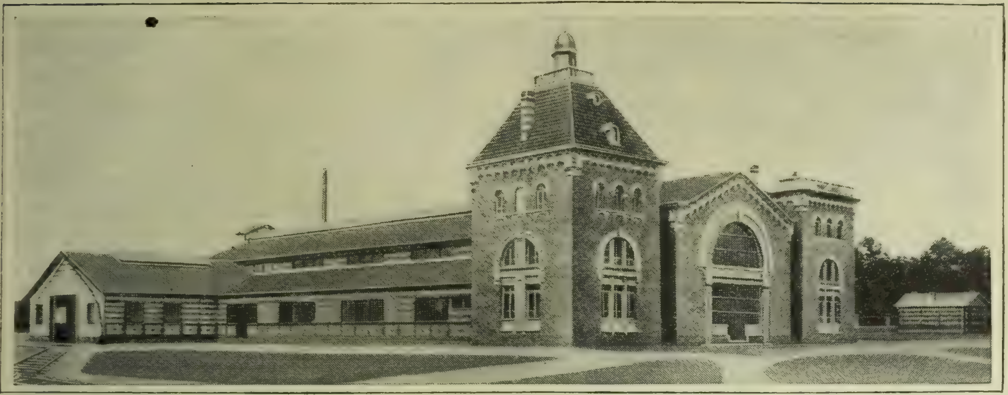


Fig. 7—General View of the Aerotechnical Institute at Saint-Cyr, France, Founded by Deutsch de la Meurthe

wide, running nearly the full length of the building, and having grouped about it the store rooms, workshops, power plant, chemical and physical laboratories, etc. Two large square towers on the front corners of the structure, three stories high, serve as headquarters for the administrative and technical staff, together with the library, drafting room, museum, etc.

Among other buildings in the original plan are dwellings for the persons in charge, and a large roundhouse one story high. The roundhouse, which measures nearly 120 ft. in diameter, was designed to shelter a whirling table, the extremity of whose whirling arm was to describe a circle some 300 ft. in circumference and carry various models subject to aerodynamic study. This can be used in any weather, while the electric road can be used only at special times, and mostly during fair and extremely calm weather.

The character and scope of the work of the Aerotechnical Institute are all that can be desired. Both governmental and commercial, both private and institutional investigations and tests are conducted. The results are made public or kept confidential as desired by the persons immediately concerned. Apparently, therefore, it meets all the needs of thorough science and practical industry.

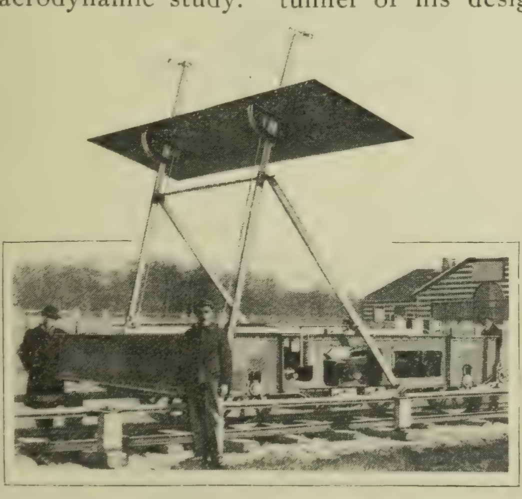


Fig. 8—Electric Car for Air-Resistance Measurements, Aerotechnical Institute at Saint-Cyr

Prior to Deutsch de la Meurthe's munificent endowment, another wealthy and liberal patron of science in France, G. Eiffel, the famous builder of the Eiffel Tower, won renown for his country and himself by elaborate researches in aerodynamics made at his own expense, and with the aid of two capable engineers associated with him. He first determined the resistance of bodies falling from the tower through still air; then he studied the behavior of models held in moving air in a wind tunnel of his design. From the experience so acquired, he, in 1912, built an entirely new aerodynamical laboratory containing two wind tunnels, a large and a small one, in which to prosecute with better advantage his splendid investigations.

This maturer type of the Eiffel wind tunnel is shown in Fig. 9. A screw suction fan, driven by an electric motor, causes air to flow through the long tube, as shown by the arrows, and to return on its outside in symmetrical flow through the room containing the tube. The current enters the tunnel by a large conical mouth containing a "honeycomb" partition at its smallest section, passes, in smooth and uniform stream, through the honeycomb into an experimental chamber, thence into the exhaust cone as seen in the illustration. Thus, for reasons that are obvious, a continuous closed circulation is maintained at a minimum cost of motive power. The models to be studied are placed in the wind stream where it emerges from the honeycomb. Their lift, their resistance and their center of pressure are determined by a special balance which supports them during an experiment. The pressure at every point of their surface is measured as explained in describing the Göttingen laboratory. This tunnel is an interesting evolution from the experience of Eiffel and his predecessors in aerodynamic research.

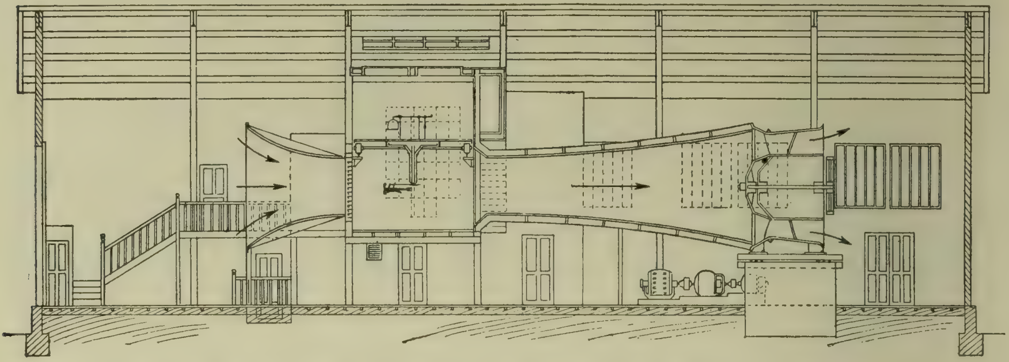


Fig 9—Longitudinal Section of Eiffel's Wind Tunnel, the Course of the Wind being Shown by Arrows; the Little Black Figure in the Center Chamber being the Model Which is to be Tested

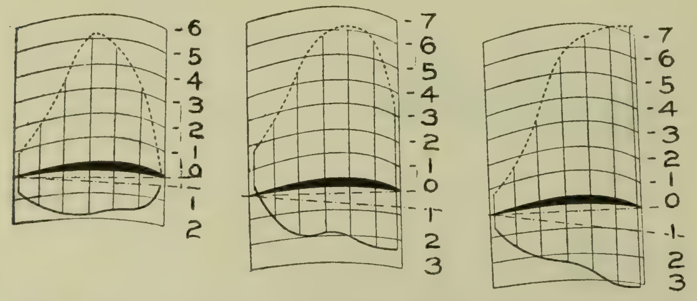


Fig 10—Pressure Distribution on a Wing Shape at Various Angles of Incidence, as Found by Eiffel by Means of Wind-Tunnel Studies

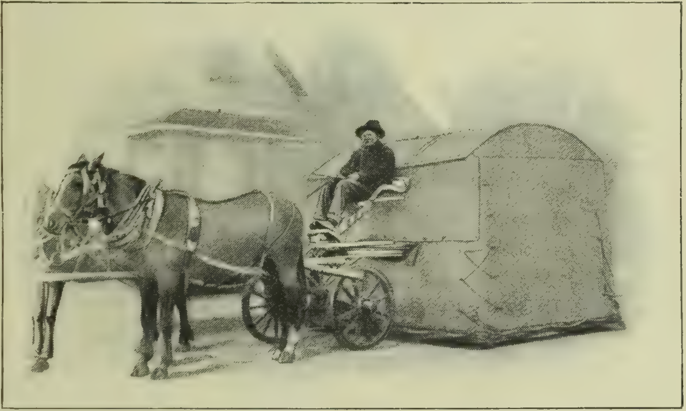
With an equipment similar to this, Eiffel and his engineers made many important investigations, particularly on plane and arched plates set at various angles to the current. Figure 10, for example, shows the distribution of pressure found on a wing shape at the angles of incidence shown. The lines projecting downward from the under surface indicate the intensity of the wind pressure at those points, while the lines projecting above the upper surface indicate the intensity of suction. The pressure or suction at any point was found by perforating the surface there, and connecting the interior of the perforation with a delicate manometer. The negative figures indicate suction intensities. By summing the point pressures so found, the resultant pressure could be determined in both magnitude and position. The particular diagrams here given show that the lift of such a wing is due much more to suction above than to pressure beneath its surface. Similar diagrams were obtained for a great variety of wing forms, and happily enough it was found that from the study of such models in the laboratory the behavior of full-size aeroplanes can be accurately predicted. Well equipped aerodynamical laboratories similar to those heretofore described, but in governmental service, have been in operation for some years in Italy and England, the former as a part of the military establishment, the latter as a part of the British National Physical Laboratory. Space will not permit an account of them in this article. But enough has been said to indicate the liberal and serious nature of the aeronautical laboratories of Europe. America is the only first-class nation without an aeronautical institute. It is to be hoped that when the American Aeronautical Institute is finally established, its endowment will be commensurate with the wealth and population of our country, and that its contributions to aeronautical science will rank with the splendid achievements of our pioneers in the practical development of aviation. The founding of such an institute, or one laboratory thereof, should appeal to any lover of mechanical science who would establish a monument of great permanent value to his country, and worthy to perpetuate his name.

ICE FLOES AS REFUGE FOR "TITANIC'S" PASSENGERS

It seems incredible, according to the Hon. P. T. McGrath, a member of the legislative council of Newfoundland, that in all the multitude of people on the "Titanic" no one thought of the ice floes as a means of saving all on board. There is widespread regret among the hardy fisherfolk of Newfoundland that this, to them, obviously simple and effective method of saving all on board was not utilized. Their idea is that the ice floes could have been used as gigantic rafts, the boats being used to convey passengers and crew to them, to remain until rescue ships arrived.

The idea is one, says P. T. McGrath, that would have immediately commended itself to a Newfoundlander, and it is one that has already won historical recognition. He here refers to the famous ice-floe journey of the survivors of the Arctic steamer "Polaris," who, in April, 1873, were picked up from an ice floe on the Grand Banks after drifting six months and covering 1,600 miles.

CANVAS HOUSING ON STREET SWEEPER



The Canvas Housing on the Rear of the Street Sweeper Keeps the Dust from Flying

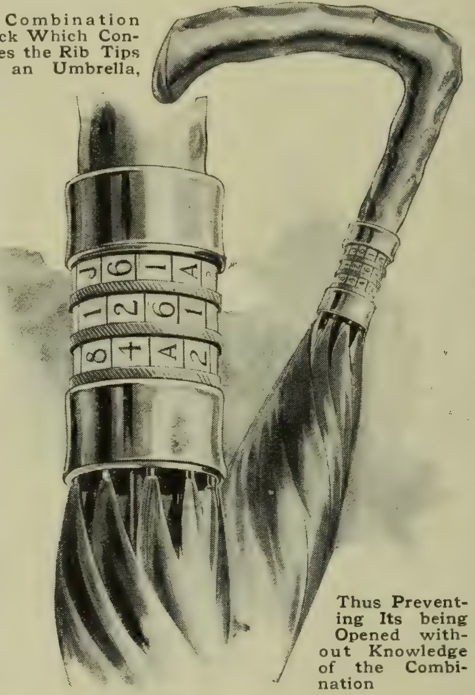
The street sweeper used in Klamath Falls, Ore., is provided with a rather unusual housing to prevent the dust from flying. Built around the rear portion of the machine, wheels and all, is a light framework covered with heavy canvas. The canvas drops close to the surface of the road, and effectively confines the dust, even when the machine is used on absolutely dry streets.

¶Incubators are used in South Africa not only in raising ostriches, but for hatching alligators, the latter being bred in large numbers to supply the demand for alligator hides.

COMBINATION LOCK FOR UMBRELLAS

An umbrella made thief-proof by being locked in such manner that it cannot be opened has been invented by a coat-room attendant of a London cafe. That it will really keep an umbrella from being "borrowed," however, is to be questioned, for, as is shown in the series of illustrations, it is very likely to be taken and then, when the borrower finds he cannot open it, dropped disgustedly in the street, which does not preserve it for the owner.

The locking device consists of a metal collar, one end of which may be slipped down over the rib tips, and is securely locked to them by revolving the three metal rings. These rings bear the letters and numerals of the secret combination.



A Combination Lock Which Confines the Rib Tips of an Umbrella, Thus Preventing Its being Opened without Knowledge of the Combination

USING THE OLD AUTO PIECEMEAL

How to put to practical use the parts of an old automobile has been ingeniously worked out by an Oregon man on his country place, according to a description given in Motor World by a visitor who was astonished at some of the results. In the living room a "lazy seat" of peculiar shape but obvious comfort turned out to be the tonneau of the old car. The leather of the seat was almost as good as new, the upholstering deep, and the settee was very roomy and inviting.

In his incubator house was a hot-water radiator which supplied the necessary heat in winter so that the heating within the incubators should not be too difficult, and this radiator was another part of the old car, the engine radiator connected up by pipes with the hot-water system of the house kitchen.

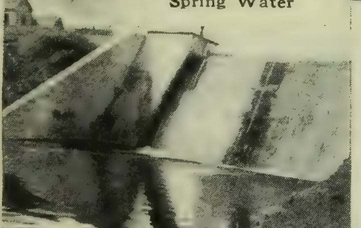
The old four-cylinder motor was set up in the basement and connected with a little dynamo, developing enough power to light the whole house. In order to obviate the necessity of running the motor and dynamo continuously, the owner had installed four accumulators or storage batteries which furnished the lighting current direct, and only needed occasional charging by the dynamo—an economical arrangement.

EXHAUSTIVE UTILIZATION OF SPRINGS

Water farming is the name that may properly be applied to the operations of an enterprising man in North Providence, Rhode Island, for he utilizes the water of two springs to supply a bottled-spring-water trade, to keep a swamp where he grows watercress for the market properly saturated, and to furnish a steady flow of pure water to a trout hatchery. Further along the little stream the overflow is dammed and supplies power for a laundry, besides which the mill pond gives a crop of fine ice every winter. All the branches of his farm are showing profits.

Reservoir on Water Farm from Which Ice Crop is Obtained

Shop for Bottling Spring Water



Dam Which Makes Available Power for Operating Laundry

Trout Hatchery on Water Farm, Using Overflow from the Springs

CHARGING BATTERIES BY MEANS OF LIGHT

The possibility of some day being able to charge electric storage batteries by exposing them to the sun, or, in other words, to economically transform the light energy of the sun's radiations into electric energy, is being advanced by a German scientist who has succeeded in charging his experimental batteries by means of ultraviolet rays.

The charging of an electric battery consists in producing through electrolysis a chemical reaction in it, which is the reverse of that which takes place when the battery is discharging or producing an electric current. Inasmuch as light, or rather the ultraviolet rays, is capable of inciting chemical reactions, it would seem, according to the French scientific magazine Cosmos, that a storage battery could be constructed which, after exhaustion, could be recharged by the influence of light.

In the experimental battery recently made by the German scientist, all that is necessary for charging is to submit the two chemicals in which its two platinum electrodes are immersed, to the action of ultraviolet rays from a mercury-vapor lamp.

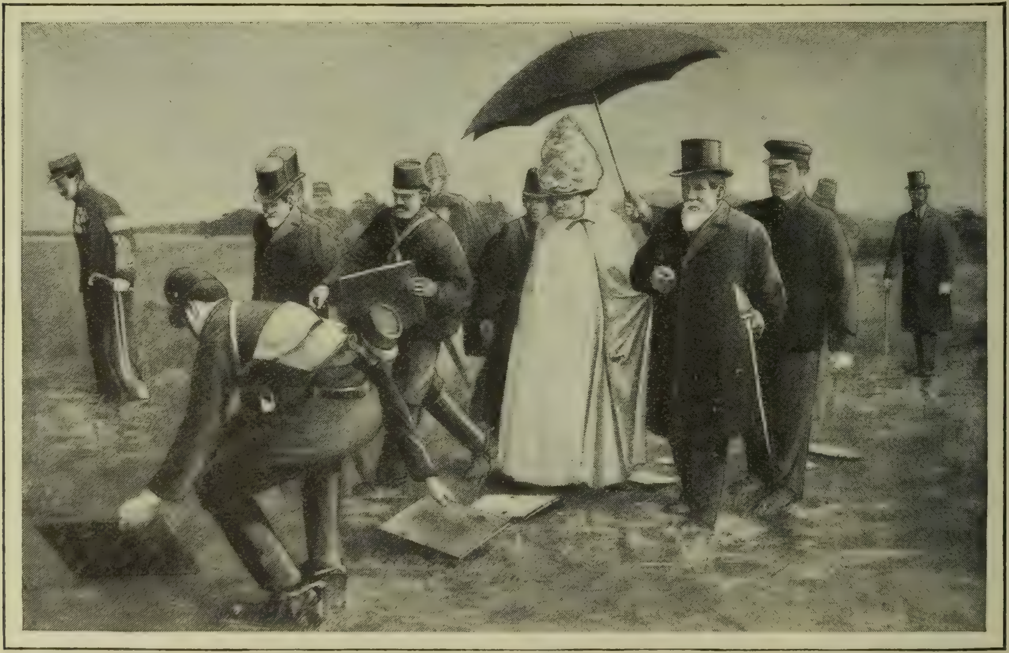
So far the battery is only a laboratory curiosity without any pretense to immediate industrial use. The cell has the usual form of a glass jar, and it would require thousands of them to produce a power of one watt, and millions to produce one horsepower.

The German scientist has also experimented with solar light, but this, with the present apparatus, gives four or five times less than the power obtained by means of the ultraviolet rays from the mercury-vapor lamp.

AMMUNITION TRAYS FOR QUEEN'S PATHWAY

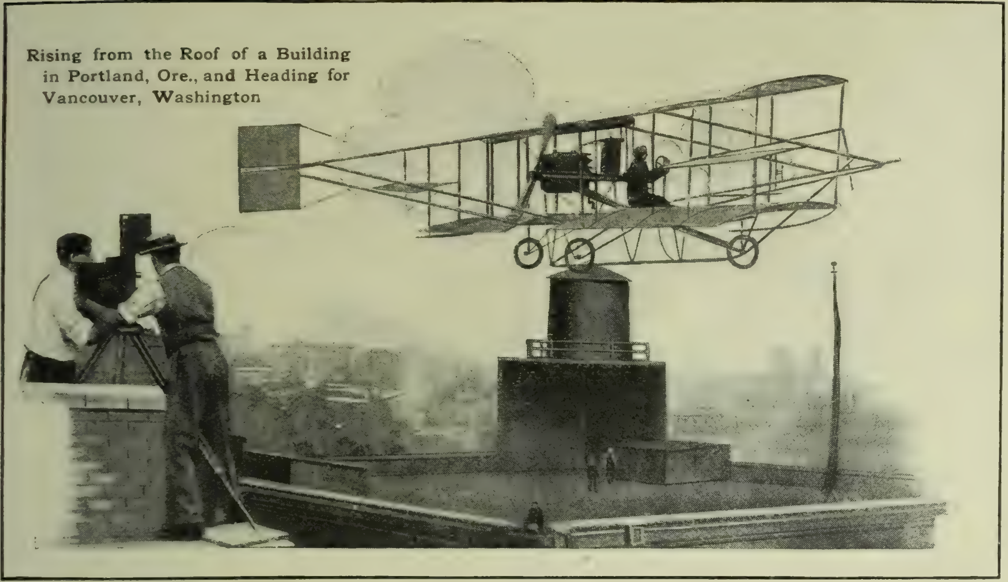
History returned to the business of repeating itself in order to make the recent visit of Queen Wilhelmina of Holland to Paris memorable, and the annals of the day written into future histories may place the Dutch Queen in the same category as Queen Elizabeth, giving the place occupied on a certain memorable occasion in the latter's life by Sir Walter Raleigh to the soldiers of a French artillery regiment. The Queen of Holland accompanied the President of France on an inspection of troops in the field and during the inspection a heavy rain fell, turning portions of the field into a morass. In order that the fair royal visitor should not get her feet wet the French artillerymen robbed their guns of ammunition trays with which they made a walk for her majesty all the way across the field. As there were only a few trays it was necessary for the soldiers to constantly pick up those that had been passed over and lay them in front of the queen as she progressed in her walk. The wooden pins on the trays to hold cartridge shells in place sank into the soft mud and held the improvised walk firmly in place.

¶"It's raining kilowatt hours," is an expression that is being used in Norway during heavy rains, referring to the fact that every inch of rainfall helps to keep filled the reservoirs which feed the great electric-power plants there.



Courtesy Illus. London News

Soldiers of France Save the Shoes of Holland's Queen by Making a Pathway for Her across a Muddy Field



Rising from the Roof of a Building in Portland, Ore., and Heading for Vancouver, Washington

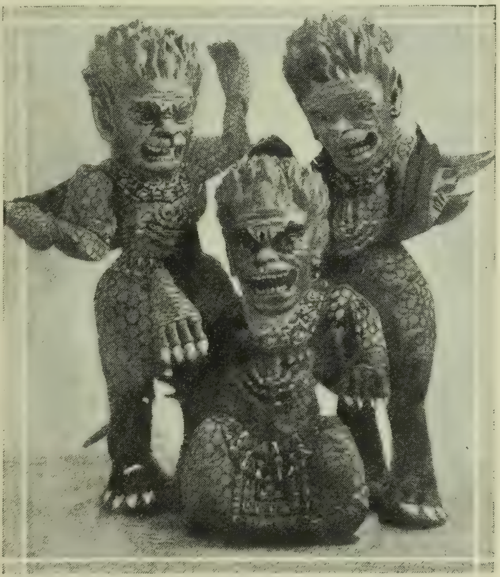
AEROPLANE RISES FROM ROOF OF BUILDING

That the provision of roof landing places on some of the latest hotels now erected or about to be erected may some day be of real practical use, instead of being just a good feature for advertising purposes, as at present, is attested to by the accompanying illustration. It shows Silas Christofferson, a young Portland, Ore., airman, rising into the air from the roof of a Portland building. A track was laid on the roof and the machine ran along this until about 25 ft. from the edge, then rose into the air, and started for Vancouver, Washington. Faulty air currents which airmen expect close to buildings did not give him much trouble.

RUSSIAN DANCING GROTESQUES

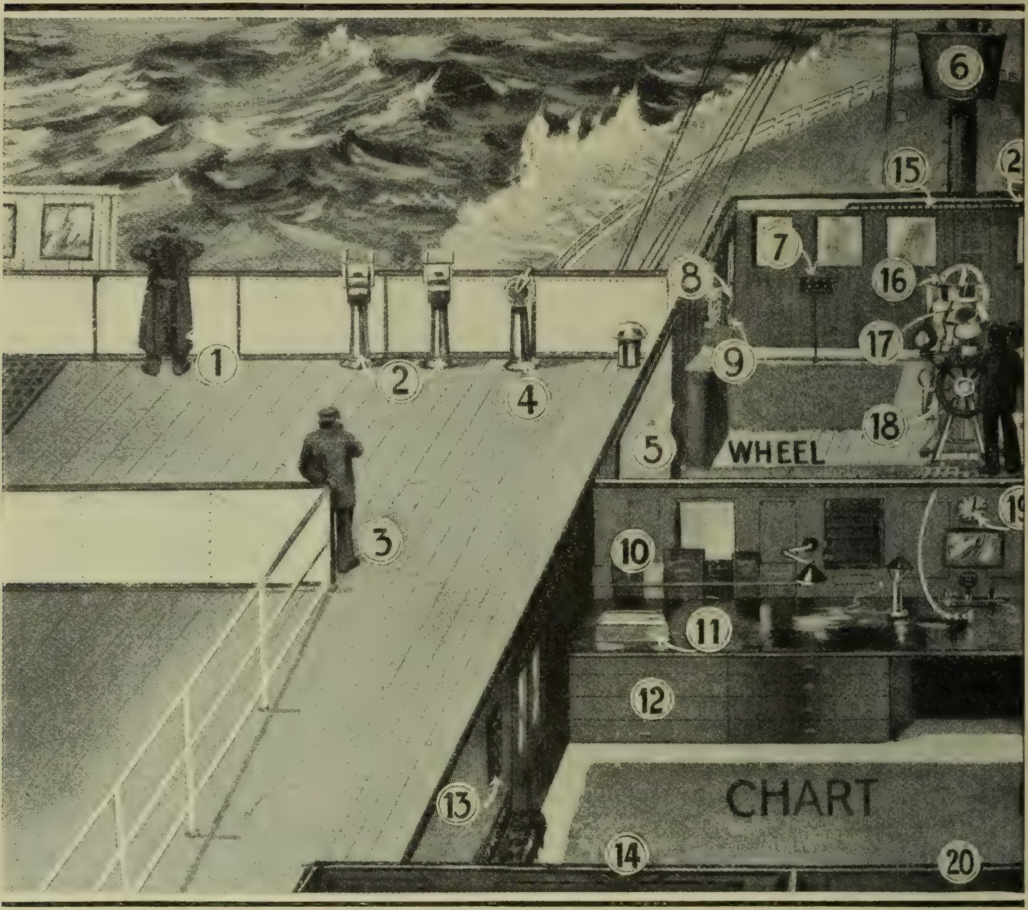
Apparently even the Russian dancers whose wonderful art has held supreme sway in European capitals, and particularly London, for the past year or two, must present novelties along with more serious work to hold the interest of the general public. At least it would seem so, for in one of the ballets presented at Covent Garden, London's premier opera house, this summer, the three dancing grotesques shown in the illustration made their appearance.

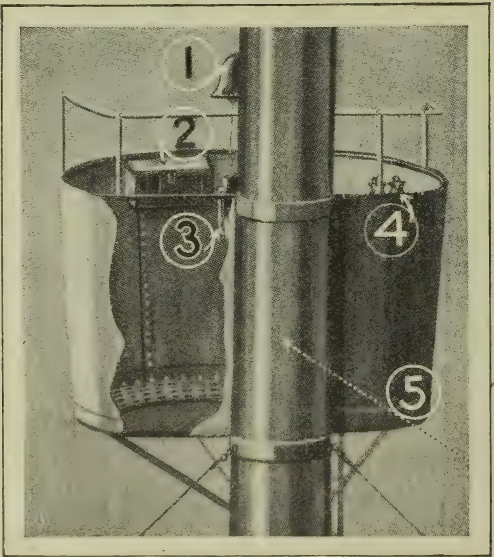
These, however, were only an insignificant part of the ballet, the greater part of which displayed the art of which Pavlova and Nordkin are still, although not now dancing together, the most famous exponents.



The Dancing Monsters of a Ballet Presented in England by the Russian Dancers

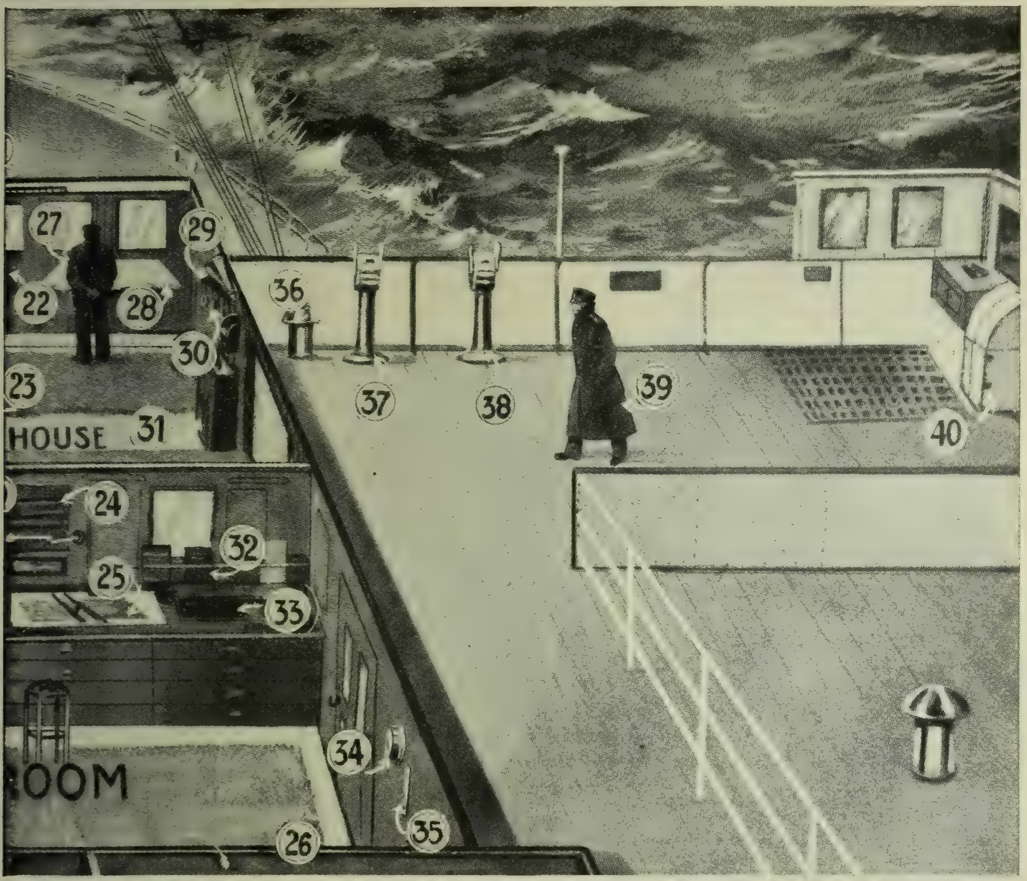
BRIDGE OF MODERN LINER, SHOWING POSITION





The Typical Crow's Nest. 1, Bell, rung every half hour; 2, Box for binoculars; 3, Telephone to bridge; 4, Speaking tubes; 5, Distance to bridge, 125 ft.

The interest evinced by the general public in steamship construction, routine, and navigation since the "Titanic" disaster has naturally been greater and more widespread than ever before. In the accompanying illustration, reproduced by courtesy of the Sphere, London, is shown in detail the positions of the officers and men of the watch, and the location of the navigating apparatus on a modern transatlantic liner. It shows, in fact, the arrangement of the bridge of the "Olympic," the sister ship of the "Titanic." 1, Fourth officer (on duty); 2, Port engine and docking telegraphs; 3, Relief quartermaster; 4, Telegraph for watertight doors, etc.; 5, Sliding door; 6, Crow's nest on forward mast, with two men always on duty; 7, Bulkhead telltale, which indicates condition of bulkheads; 8, Submarine signaling receivers; 9, Engine room and crow's nest telephone; 10, Logbooks; 11, Magnetic clock case; 12, Drawers for charts; 13, Bridge switchboard; 14, Chief officer's cabin; 15, Telltale points; 16, Hydraulic ram for governing steering engine; 17, Binnacle; 18, Wheel; 19, Clock; 20, Officers' quarters; 21, Pointer; 22, Fire-alarm bell, ringing throughout the ship; 23, Quartermaster at helm; 24, Shutters pulled down at night; 25, Chart spread on plate glass; 26, Captain's cabin; 27, Ordinary seaman on bridge;



28, Work table; 29, Megaphone; 30, Poop telephone; 31, Signal locker; 32, Compass table; 33, Chronometers; 34, Barometer; 35, Thermometer; 36, Ventilator; 37, Starboard docking telegraph; 38, Starboard engine-room telegraph; 39, Chief officer of the watch; 40, Starboard lamp box.

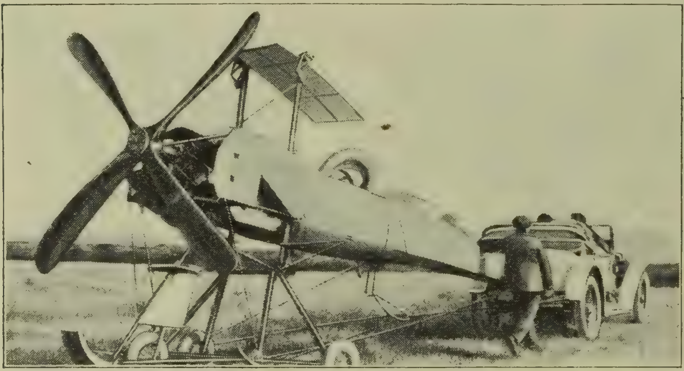
IRON-WELDING PROCESS USED BY ROMANS

Methods employed by Romans, during their occupation of England, in welding iron have come to light through recent investigations by British scientists following the discovery of one of the largest masses of Roman wrought iron ever found in England. This was unearthed at the site of an ancient Roman town west of the village of Corbridge, on the Tyne. The block of iron was 3 ft. 4 in. long by 7 in. square at one end, which was rough and rather spongy, tapering down to about 4½ in. square at the other end, which was well rounded. It appeared that the block was made by welding together comparatively small lumps of iron produced by a direct reduction process in small charcoal fires. The block was sawed through its entire length and the cut faces planed, polished, photographed and afterward etched with a solution of nitric acid and water and again photographed.

After the faces had been strongly etched, it was easy to trace the lines of welding, not because of the imperfection of the welding, which was generally very good, but on account of the slight physical difference in character of the metal on the sides of the junctions. From these sections it was perfectly clear how the pieces were joined together. In general terms, slabs approximately lenticular in section were employed. After the smaller end was made, the piece at this stage probably had a similar appearance and shape to the upper end of the block in the condition in which it was found in the furnace with projecting taper pieces. After forming the foundation piece, two slabs must have been inserted and the mass then heated to welding temperature, after which it was removed and welded by hammering, but by what kind of implements there is no evidence. Step by step this process was repeated until the block of the size and dimensions as described was obtained, plus, of course, the portion which had been removed by subsequent rusting. It seems probable that the block was in course of further development at the time it was left in the furnace.

MILITARY AEROPLANE WITH FOLDING WINGS

The difficulty of hauling aeroplanes along a road and over fields is a problem considered of no small importance in French army circles, and one way developed to do away with much of the difficulty is here shown. The machine is a Moineau biplane, whose planes may be readily folded for road haulage without detracting from the strength and stability of the machine when in flight.



A French Military Aeroplane Whose Wings can be Folded When the Machine is being Hauled over Roads or Fields

ℭA school to teach women to be carpenters and bricklayers is to be started at Winfield, Long Island, this fall and it is reported that 40 women have already enrolled as students.

"JAY WALKING" STOPPED IN KANSAS CITY

The city pedestrian who cares not for traffic regulations at street corners, but strays all over the street, crossing in the middle of the block, or attempting to save time by choosing a diagonal route across a street intersection instead of adhering to the regular crossing, is designated as a "jay walker," in Kansas City.

Kansas City recently adopted a new ordinance for the control of foot traffic as well as vehicles, and "jay walking" is to be prevented as rigidly as "jay driving."

HORSELESS CITY PLANNED IN INDIANA

Horses will be barred from the new town of Speedway, laid out in the environs of Indianapolis. By autumn, it is said, the new city will be well under way and it is expected that the place will become an important industrial center, devoted exclusively to interests allied with the motor-car trade.

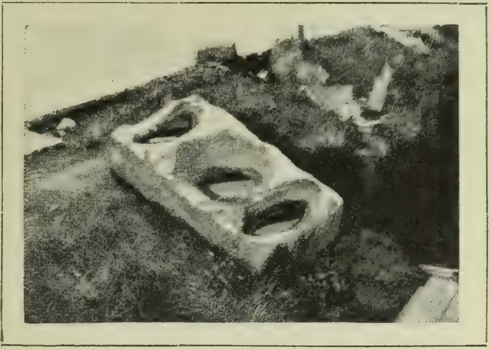
It is admitted that the humble equine is aiding in building the new town, but after it is completed, neither he nor any of his four-footed fellows will be permitted to enter the city sacred to motor-driven vehicles. Leases will stipulate that horses must not be used for any purpose; and the butcher, baker and grocer will necessarily have to resort to the motor truck for delivery purposes. The fire department will be wholly equipped with motor-driven apparatus, and the patrol wagons will race down the streets without clatter of iron-shod hoofs.

The government of Speedway will be intrusted to men identified with the motor trade, and the streets will bear names illustrious in the motor world.

The principal part of the new city will be directly south of the Indianapolis motor speedway, while part of the town will be west of the famous track. No factories will be admitted in Speedway unless they are in some manner identified with the motor-car trade.

Another feature of the horseless town is that it will be constructed throughout of concrete, rendering it fireproof. It is predicted the motor fire department will have little to do.

A SPEAR SHARPENER OF THE ROMANS

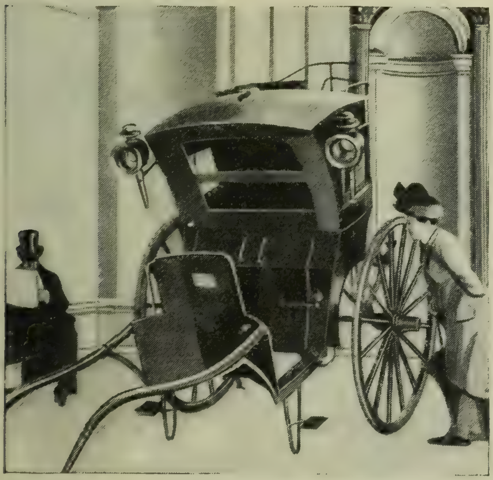


Courtesy Illustrated London News

A Stone Found in England and Probably Used by the Romans for Sharpening Spearheads

Among the recent discoveries at Wallsend, Eng., at the end of the great Roman wall which stretched across Britain, is a stone which is believed to have been used by the Romans to sharpen their spears. The hollow in the middle probably contained water in which the spearheads were dipped before being sharpened by being rubbed on the sides of the two other cavities.

HANSOM CAB TAKES PLACE IN MUSEUM



The Hansom Cab is so Nearly Extinct in London that One of Them has been Placed as an Exhibit in the London Museum

That the hansom cab, whose real home was London, should have become so rare in that city that one has actually been installed in the London Museum as a curiosity, may seem startling even to some Londoners at home, to say nothing of the Englishmen who have been away from home even no longer than four or five years and still keep vividly in mind London as they last saw it.

Although "'ansom, sir?", is still heard once in a while in London, this type of vehicle is almost extinct, and its complete disappearance is expected in the near future.

ℭThe trackless trolley system has been adopted, after thorough tests, for the haulage of freight in Altona, Germany.

THE INFINITELY GREAT AND THE INFINITELY SMALL

By FOREST RAY MOULTON

THE discoveries of modern science have astonished men both by revealing how enormously large the universe is, and also by showing how infinitely small the minutest particles of matter are.

The earth is very big and, until two or three centuries ago, was supposed to be the largest thing in the universe. But the sun is a million times as large as the earth; the whole solar system is 800 million times as big as the sun; the Orion Nebula is 16,000 million times as big as the solar system; and that part of the universe which is now within the range of astronomers' telescopes is 100 million times as big as the Orion Nebula.

While the earth is infinitesimal when compared to the universe beyond, it is yet of enormous dimensions, for there are in it 2,000 million cubic miles of matter. The average weight of a cubic mile of the earth is 23,000 million tons. In each ton there are on the average 10,000 cubic inches. The smallest object visible through a powerful microscope has a diameter of about one ten-thousandth of an inch. There are one trillion of these units in a cubic inch. The material of which the earth is composed is made up of small units of many kinds of matter called molecules. The investigations of Lord Kelvin have shown that it would take 50,000 molecules placed in a row to make a line one ten-thousandth of an inch long. Therefore, in one microscopical unit of material, there are 125,000 billion molecules. The molecules are made up of from two to a hundred smaller masses which the chemists call atoms. Probably an atom is not over one thousandth the size of a molecule. Recent discoveries respecting radium have proved that the atoms themselves are made up of very many smaller particles called electrons, or corpuscles. In an atom there are from 1,000 to 200,000 of these electrons, and on the average the volume of each electron is probably not greater than one one-hundred-thousandth of that of an atom. From this it is apparent that the infinitely small is as astonishing as the infinitely large.

A little reflection on the very large and the very small leads to some most astonishing conclusions. It is found that things are not great or small in the absolute, but only relatively to ourselves and the things with which we are most familiar. To illustrate this, suppose that on some night every person in the world should become unconscious and that, by some miracle, everything in the world and beyond it should become just one-half as great in length and breadth and thickness as it is now. The question is whether a person would detect any difference when he awoke in the morning. He would find his clothes only half as large in each direction, but they would fit him just the same because he would be only half as large in each direction. His chair would be only half as high, but it would seem just as high to him because he would be only half as tall. When he left the house to go to the car, the distance would be only half as far, but it would seem just as far because his steps would be only half as long. In fact, everything would seem just the same to him, and it can be absolutely proved that there would be no way whatever for anyone to find out that there had been a change. This is, of course, under the hypothesis that only the lengths, breadths, and thicknesses are divided by two, while everything else remains unaltered.

Now, it is clear that there is no reason why it should be supposed that everything is divided by exactly two. The results would be the same if it were supposed that, instead of being divided by two, everything were increased by the factor two, or even to such an extent that a man would be as big as the earth is now. Other men and things would be increased in the same proportion and he would seem to himself no larger than he does at present. Or, if everything were diminished so that a man became the size of a microbe, he would notice no change and would feel just as big and important as he does now.

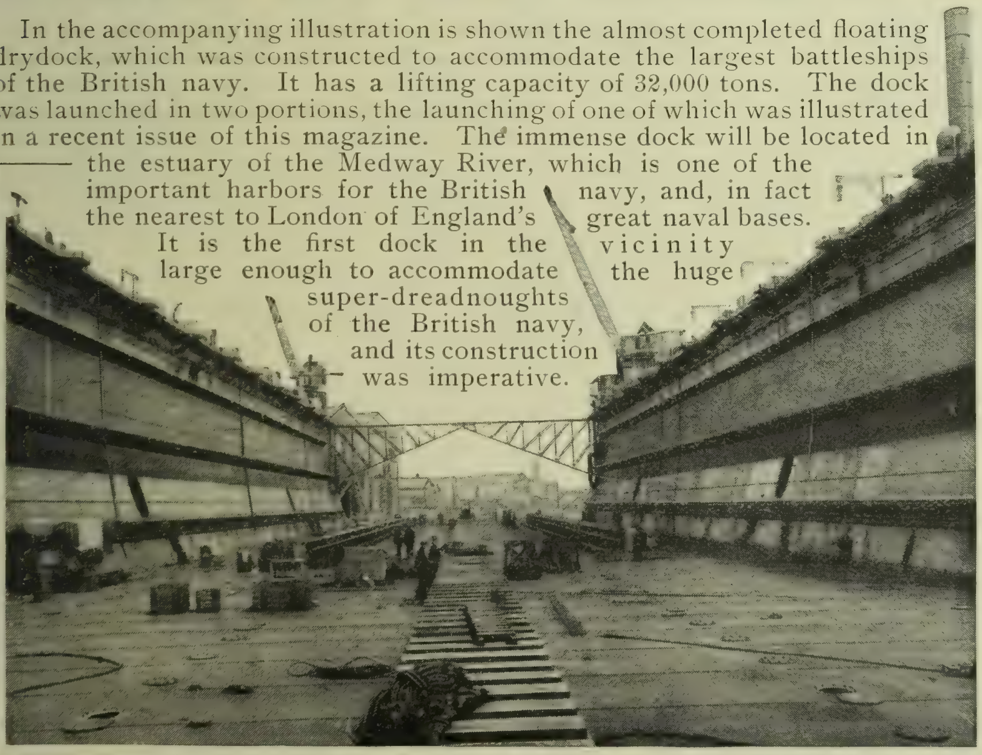
It is not in space alone that matters are purely relative. In time the situation is exactly the same. If the earth and celestial bodies moved twice as fast, if clocks ran twice as fast, and if our thoughts came twice as fast, we should not be able to detect any change. If, indeed, everything should run so fast that the experience of a life time would be concentrated into what is now one second, a man would seem to himself to live just as long as he does under present conditions. When misfortunes or troubles overtook him, the hours would seem to drag along as slowly as they do now. Or, on the other hand, if things should go more slowly, time would seem to pass as fast as it does at present.

It can be gathered from these illustrations that what is great or small, or long or short, is purely so relatively to our experiences. It follows that time, for example, in its most fundamental sense is not measured for a thinking being by clocks and watches or a circling world, but by the number and variety of thoughts that flash in his consciousness. Hence there can be no doubt that a life in its true measure is long or short according to its intellectual experiences.

¶The horse butchers of France have recently held a meeting for the purpose of requesting the government to enforce a tariff on imported horse meat in order to protect the native butchers.

ENGLAND'S NEW FLOATING DRYDOCK

In the accompanying illustration is shown the almost completed floating drydock, which was constructed to accommodate the largest battleships of the British navy. It has a lifting capacity of 32,000 tons. The dock was launched in two portions, the launching of one of which was illustrated in a recent issue of this magazine. The immense dock will be located in the estuary of the Medway River, which is one of the important harbors for the British navy, and, in fact the nearest to London of England's great naval bases. It is the first dock in the vicinity large enough to accommodate the huge super-dreadnoughts of the British navy, and its construction was imperative.



The Floating Drydock Which Will Accommodate England's Largest Battleships

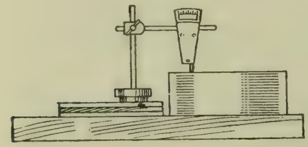
SEAWEED-TRIMMED HAT FOR THE SEASHORE

One of the latest fads at English seaside resorts is the seaweed-trimmed hat, an example of which is shown in the illustration. The straw hat is trimmed entirely with seaweed and shells. The seaweed is dried by a special process, and, when prepared, has all the "life" and luster of fresh seaweed. The sea shells are used to decorate the crown.

A Novelty in Hat Trimming; Straw Hat Decorated with Seaweed and Shells

GERMAN SURFACE GAUGE

An ingenious surface gauge or level, manufactured in Germany, is shown in this drawing. Adjustably mounted on an upright, the gauge is moved over the surface to be tested so that the pin just touches it, and by a properly arranged system of levers, the motion, if any, of the pin is magnified a hundred times. Thus, if there is an uneveness in the surface, the indicator hand will be deflected to one side or the other of the zero point, according to whether there is a depression or a ridge on the surface. The gauge is made in various forms for different purposes.



FIRE EXPOSITION TO BE HELD IN NEW YORK

The first international conference of men interested in the ways and means of fire prevention and extinction, and exhibition showing methods of fire prevention, fire protection and fire fighting, is to be held in New York during the early part of October. Fire chiefs and commissioners from nearly all the principal cities of the United States will be present as delegates; and awards will be made for new inventions.

During the exhibition daily sessions will be held for the consideration of means of fire prevention and protection, addresses being made by builders, architects, engineers, fire chiefs and fire fighters, and insurance men. Fireproof building construction, fire-alarm systems, automatic sprinklers and fire extinguishers, fire escapes, motor fire apparatus, and, in fact, practically every device for fire prevention and fire fighting will be exhibited and demonstrated.

SIX-WHEELED MOTOR BUSSES

Motor omnibuses with three pairs of wheels will soon be seen on the streets of Paris if the plans of the General Omnibus Company are carried out. Only a small number will be put into use at the outset. The middle pair of wheels will serve as drivers, while the steering will be done by both the front and rear pairs. The objects attained are increased carrying capacity, ability to turn in a small space and the avoidance of skidding. It is pointed out, however, that the spring suspension of the three axles presents a problem which has not heretofore been satisfactorily solved. In the new design only the two rear pairs of wheels will have connected spring suspension while the front axle will remain independent. It will depend on the experiences made with the present system of spring arrangement, whether more busses of this type will be put in service or some modification therein devised, before they can be generally adopted.

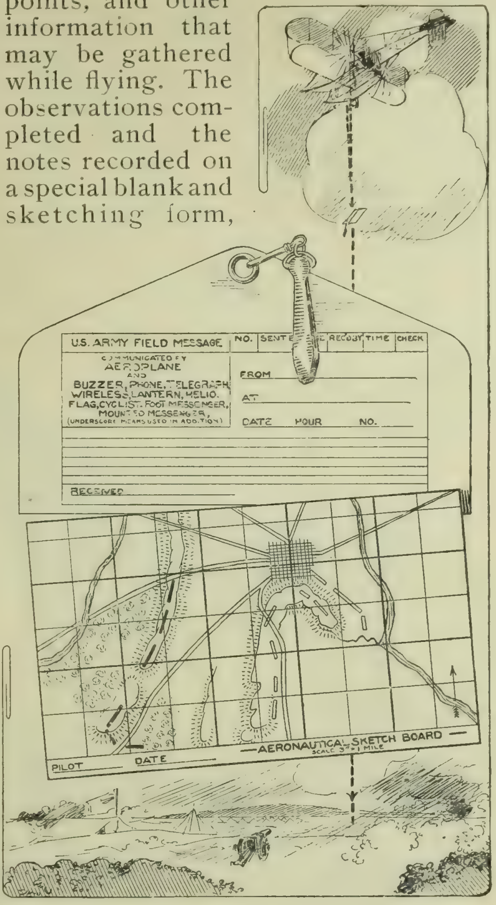
ANTHRACITE COAL MADE IN LABORATORY

What geologists say nature took millions of years to produce, a German scientist has accomplished in hours in his laboratory. He has made hard coal from peat and even from cellulose, which is the chief part of the solid framework of plants, by heating it in a specially constructed apparatus under great pressure. At a temperature of 590 deg. F., cellulose was converted into coal in 64 hours; and at 644 deg., in eight hours.

From data obtained by a series of such experiments, the scientist has deduced the length of time necessary for the formation of coal beds in nature, and his result tallies closely with that calculated by geologists from entirely different considerations.

SKETCHING BOARD FOR MILITARY AIRMEN

The value of the military aeroplane for scouting purposes has been considerably enhanced by the adoption, in the United States army, of a weighted sketching board by means of which the airman can communicate his information to the forces in the field without descending to the ground. Private Harold Wiedenfeld, of the U. S. Signal Corps Aviation Detachment, is the inventor of the board which is so arranged as to enable a military observer in an aeroplane to mark down all possible information as to the location of the enemy's lines; distance of opposing troops; approximate strength of his army; conditions of country surrounding position occupied by opposing army; roads leading to advantageous points, and other information that may be gathered while flying. The observations completed and the notes recorded on a special blank and sketching form, the board is dropped to the ground, a weight being attached to it that it may fall as close to the desired point as possible.


U.S. ARMY FIELD MESSAGE
NO.
SENT
RECD BY
TIME
CHECK
COMMUNICATED BY
AEROPLANE
AND
BUZZER, PHONE, TELEGRAPH, WIRELESS, LANTERN, HELIO. FLAG, CYCLIST. FOOT MESSENGER, MOUNTED MESSENGER,
(UNDERSCORE MEANS USED IN ADDITION)
FROM
AT
DATE
HOUR
NO.
RECEIVED
AERONAUTICAL SKETCH BOARD
SCALE 3" = 1 MILE
PILOT
DATE

Army Sketching Board Used by Military Observers to be Dropped from Aeroplanes

Experiments with the device have been conducted by Capt. Frederick B. Hennessy and Capt. Charles DeForest Chandler. Both men have gone up, spun around the College Park, Md., aviation field, observed locations of roads, and then dropped the board within 10 ft. of a given spot. In a campaign, it is believed the sketching board would prove of great value to an army in the quick manipulation of troops.

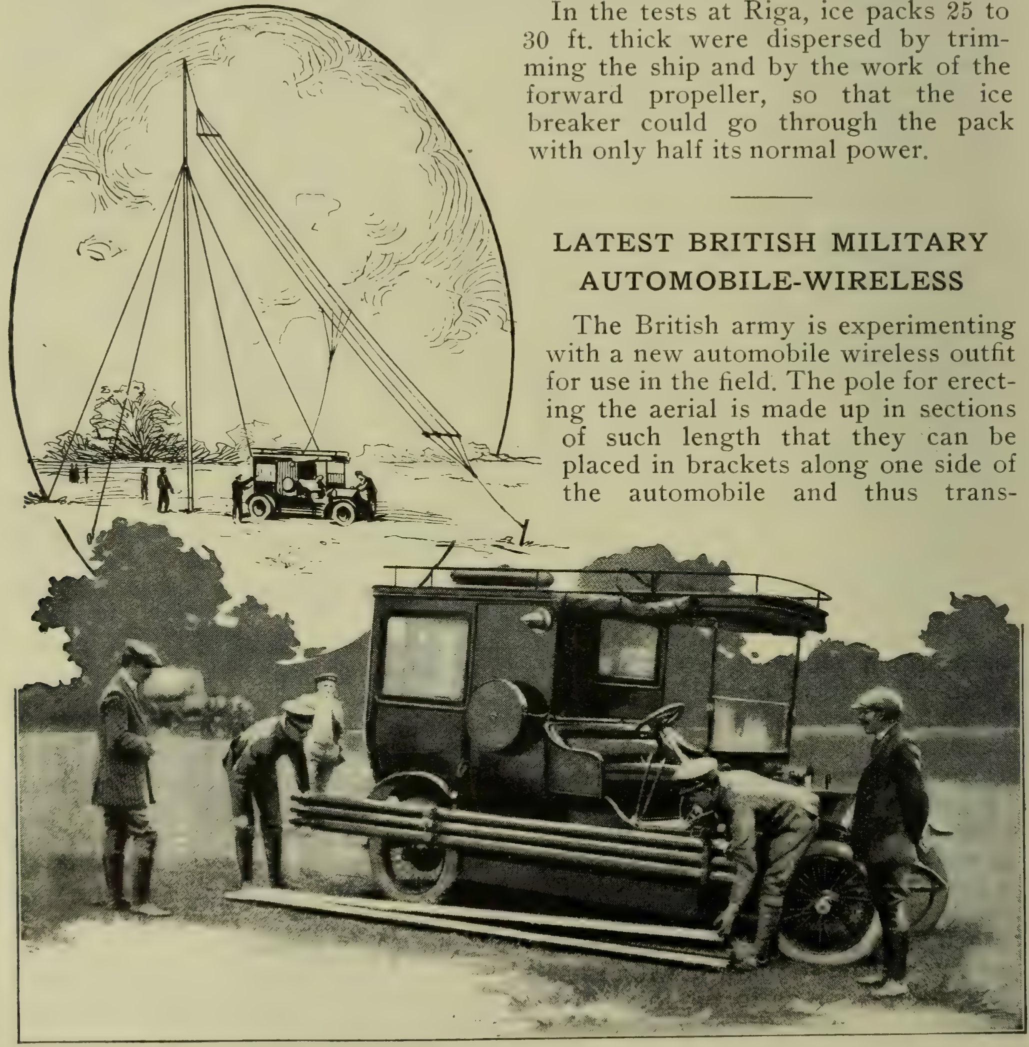
ICE-BREAKING STEAMER OF GREAT POWER

An ice-breaking steamer of unusual design for use in the harbor of Riga, Russia, was completed last spring at Gotenburg, Sweden. Though only 182 ft. long over all, the depth of the boat is 27 ft. 6 in. with a draft of 21 ft. 4 in., so as to put the screws well below the ice line. The beam is 50 ft. 10 in. and the displacement 1,900 tons. From the water line the bow slopes back at a flat angle, so that the keel length is only about 130 ft., and at the junction of the bow and keel is a small screw (housed under the hull) which serves to disturb the water and ice packs. This is driven by an engine of 1,200 hp., while the main propelling screw is driven by an engine of 2,500 hp. Both engines are triple-expansion and steam is supplied by four boilers. The designed speed is 12½ knots (14.4 miles an hour), but on the trial the vessel developed 14½ knots and 4,000 hp. for the two engines. Flat surfaces are avoided, to reduce the liability of the vessel being caught in the ice, and numerous tanks formed in the hull provide for varying the floating line or "trimming" the vessel, as seafolks say.

In the tests at Riga, ice packs 25 to 30 ft. thick were dispersed by trimming the ship and by the work of the forward propeller, so that the ice breaker could go through the pack with only half its normal power.

LATEST BRITISH MILITARY AUTOMOBILE-WIRELESS

The British army is experimenting with a new automobile wireless outfit for use in the field. The pole for erecting the aerial is made up in sections of such length that they can be placed in brackets along one side of the automobile and thus trans-



The British Army's Automobile-Wireless

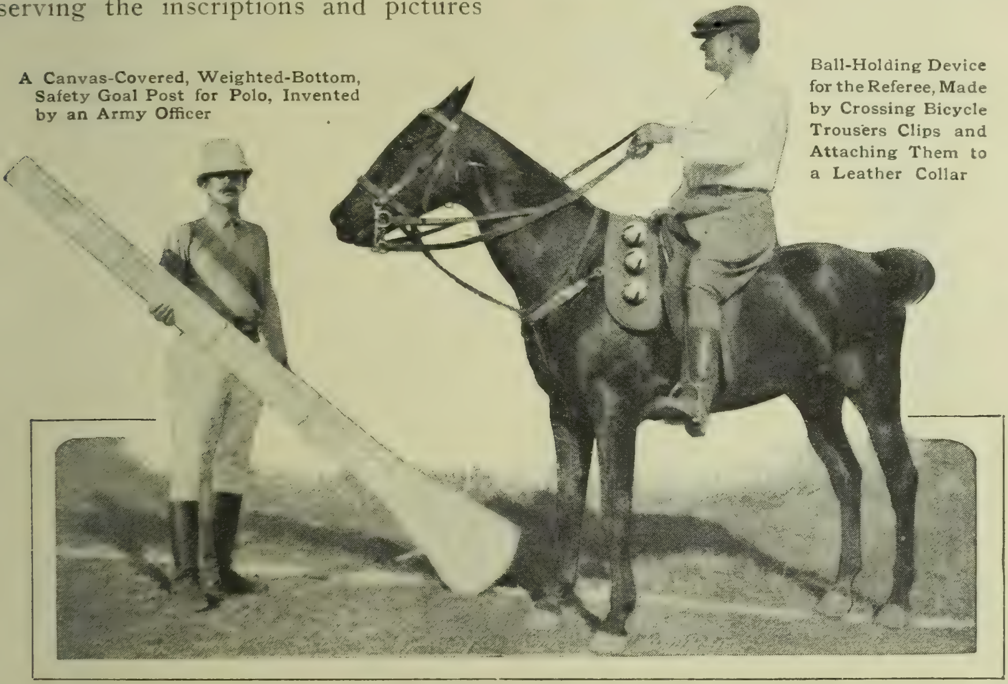
ported. The illustrations show the pole sections being taken from the automobile for erection, and the aerial erected and connected up with the receiving and sending apparatus located within the body of the car.

MAKING EXACT DUPLICATES OF ROCK WRITINGS

The United States National Museum utilizes a very ingenious method of preserving the inscriptions and pictures hewn or graved into rocks by the Indians of the southwest. Molds are taken of the pictures by means of wet sheets of paper pressed into the cavities until every part of them is entirely filled. The paper when dried and removed gives a perfect matrix, reproducing even the grain or texture of the stone. Any number of duplicates can thus be made for the use of scientists and institutions, and authentic reproductions of the inscriptions kept, even should the original be effaced from the rock by climatic agencies or by vandals. It is planned to collect as many of these impressions as possible for the museum.

TWO NEW DEVICES FOR POLO

Two new polo features have been introduced by Col. C. G. Treat of the 3rd Field Artillery, stationed at Fort Sam Houston, Texas. One of them is a goal post made of wood, skeleton construction, with a wide tapering base which is heavily weighted with lead, the entire post being covered with canvas, painted white. The weighted bottom makes the post stand firmly, but allows it to yield when struck by horse or player without doing serious injury to either, as sometimes occurs with the stationary posts. It has been tried in practice and found to work well.

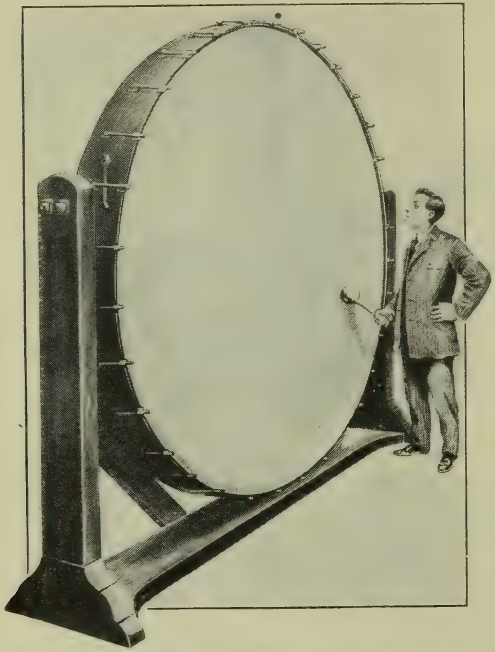

A Canvas-Covered, Weighted-Bottom, Safety Goal Post for Polo, Invented by an Army Officer

Ball-Holding Device for the Referee, Made by Crossing Bicycle Trousers Clips and Attaching Them to a Leather Collar

The second device is a ball holder for the referee, and is an excellent example of how a device designed for a certain use can be adapted for other uses. The ball holder is made of heavy leather in the form of a flat collar, attached as shown in one of the illustrations. Each side of the holder is equipped with three ball containers, made by crossing a set of trousers clips of the kind used by bicycle riders. These are attached to the leather collar by small leather strips and rivets. The hardest riding cannot dislodge the balls from these clips, yet they are easily removed when needed.

BIG DRUM FOR MUSICAL FESTIVAL

In the accompanying illustration is shown a big drum, about 10 ft. in diameter, built especially for the Handel musical festival, recently held in London. The great festival chorus included considerably more than 3,000 voices, and the total number of performers was 4,000.



The Great Drum Built Especially for the Handel Musical Festival in England

COMPRESSION OF LUNG AS TUBERCULOSIS CURE

Treatment of tuberculosis by nitrogen-gas compression of the lung recently has been revived after falling into disuse since it was first introduced by a Chicago surgeon 15 years ago. Successful results have been reported by physicians in Europe and America. The method employed is compression of the lung so that no air gets into it, and it is thus given complete rest, with a minimum of blood on which the germs can grow. Frequently the patient's condition improves. Authorities state that it can be used only in one-sided cases with not many adhesions between the lung and chest wall. The apparatus consists of a water-locked tank similar to a gas receiver, a tank of compressed nitrogen and the necessary tubes and needles for injecting it into the cavity between the lungs and the wall of the chest. One physician recently reported that the tubercular process was arrested in an astonishing percentage of cases in which it was employed by him.

THE BATTLE-CRUISER RIVALRY IN EUROPE

The rivalry between England and Germany in the construction of battle-cruisers, the wonderful new type of fighting ship developed by England and imitated by Germany, is, if anything, more tense than was the rivalry in dreadnoughts.

A battle-cruiser is a ship possessing the battleship's armament of heavy guns, but comparatively lightly armored, defensive strength being sacrificed for aggressive qualities. With their great speed, extended steaming radius, and powerful guns they can roam the seas unmolested except by other ships of their own class. Even the dreaded torpedo-boat destroyers are no menace, the sustained speed of the battle-cruiser at sea being higher than that of any present-day ocean-going destroyer.

When Germany produced in the "Moltke" the fastest battle-cruiser in the world, with a speed of 29.5 knots (33½ miles an hour), England pinned her hopes on the new "Lion," and she was not disappointed. This remarkable vessel succeeded, under very trying conditions and with coal only as fuel, in making the phenomenal speed of 31.5 knots (35.75 miles an hour). Under favorable conditions, and using oil, it is believed that the "Lion" can make about 33 knots (38 miles). The next German battle-cruiser, which was laid down last year, but as yet is not far enough advanced to be known otherwise than as "K," much is expected. Just how much is not clear, for secrecy is rigidly maintained in the German navy, but it is believed that she will be driven by engines of at least 90,000 hp., as compared with the 80,000 hp. of the "Moltke," and that she will carry 14-in. guns. This vessel is expected to be more powerful and faster than the British "Lion," the "Princess Royal," and the "Queen Mary," the latter being a little larger and more powerful than the "Lion."

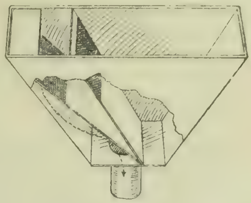
England, however, will probably have completed her "Tiger" by the time the German "K" is ready, and thus Germany will remain behind in the race, as this ship will, it is believed, develop 100,000 hp. It is also believed that she will be longer than 725 ft., that she will be a 32,000-ton ship, and that her speed will be greater than 33 knots.

ARTIFICIAL RUBBER FROM SEA FISH

According to the British Consul at Amsterdam, a factory is being built at the fishing harbor of Ymuiden for the manufacture of artificial rubber from sea fish. The process was invented by an Amsterdam physician, and he claims that the product has the same qualities as real rubber and is not affected by benzine or heat.

Estimates show that the fish rubber can be produced at a cost representing only about one-sixth of that required for the manufacture of real rubber, due in part to the manufacture of a valuable by-product in the shape of a concentrated tonic food containing phosphor albumen.

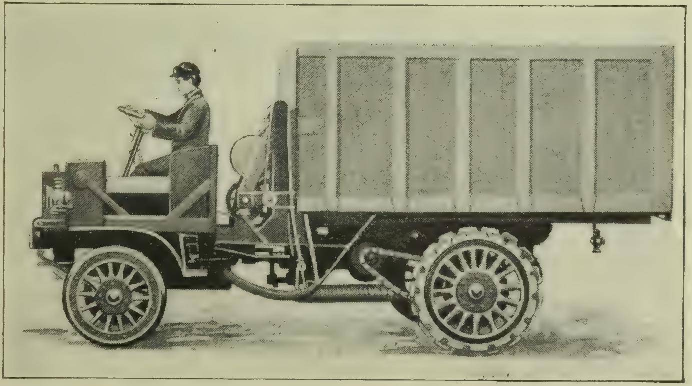
NEW IDEA IN GASOLINE FUNNELS



A funnel which requires no chamois-skin strainer to eliminate water and sediment from gasoline as it is poured into the tank of a car, is another novelty for motorists. The gasoline is poured into the large top opening and must flow from the surface through two special copper screenings before reaching the outlet in the bottom of the funnel. The claim is that, the screen being so fine, not a particle of water can flow through it, although gasoline passes readily.

SEVEN-TON DUMPING MOTOR TRUCK

A motor coal truck of seven tons' capacity, which can be dumped by one man, is being turned out by an eastern automobile concern. The ease and expedition with which a single man can dump a full load by operation of the hand mechanism, is due to the fact that the load-carrying body is balanced near its middle. All that is necessary is to turn a crank until the center of gravity of the almost balanced weight falls back of the pivot,



A 7-Ton Coal Truck Having a Hand-Dumping Body the tipping then being automatically completed by the load itself. The whole load is, of course, carried over the rear wheels, which are heavily reinforced.

NEW "BEWARE-THE-DOG" SIGN FOR DOORS

Many kitchen doors or doors of entrances for the use of tradesmen in England are now found bearing a novel warning sign against dogs, with a more ingenious legend than the old "Beware the Dog," which has become so stereotyped as to command but little attention and usually fails to serve its purpose.

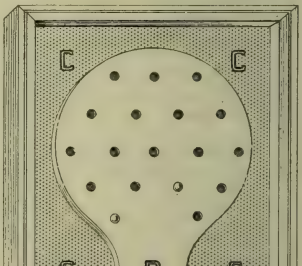
"The Dog Behind This Door Bites" is a New Substitute for the Stereotyped "Beware the Dog"

DISEASES OF ANCIENT EGYPTIANS

Studies of mummies and skeletons from the tombs and excavations of Egypt, which have been carried on at a medical school in Cairo by Drs. Elliott Smith and Marc Armand Ruffer, have disclosed many points of identity of the diseases of from two to four thousand years ago and the diseases of the present day, as well as marked differences. Gallstones and similar concretions were common, and evidences of bacterial infections were found in some bodies. Malignant diseases, gout, leprosy, infantile paralysis, and appendicitis seem to have existed in the days of the Pharaohs, while hardening of the arteries due to age was common then as now.

In the study of skeleton remains, which are the most satisfactory of all for historical study, there is confirmation of the previously demonstrated fact that an inflammatory condition of the joints resulting in deformity was remarkably prevalent in the Nile Valley, both during the earliest times and later; the spinal column, the finger and toe bones being very often so affected. So far no evidence of tuberculosis of the bones has been found in old Egyptian remains. Dental disease was prevalent, the molars, as now, suffering most. The old tradition that the ancient Egyptians were skilled in dentistry is not substantiated, however, by recent investigations.

A MERCURY GAME POPULAR IN FRANCE

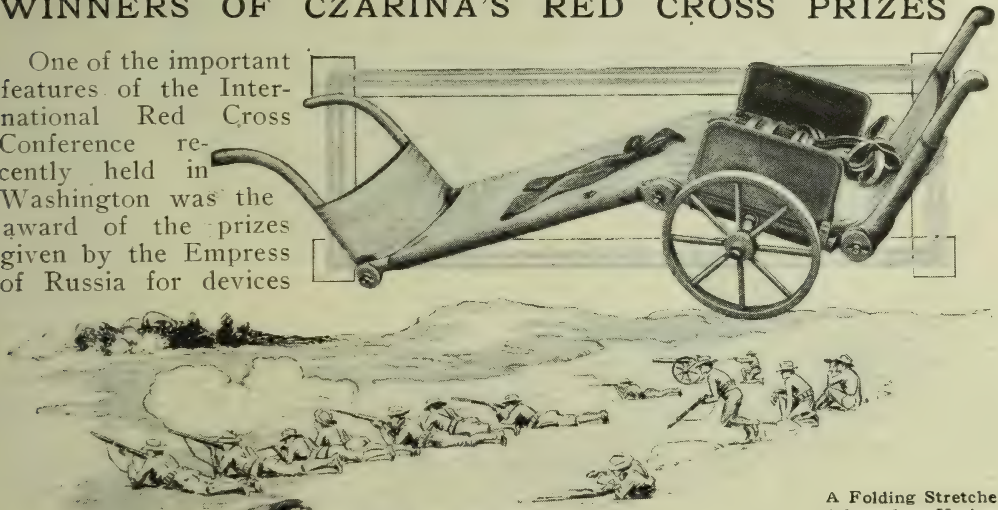


A mercury game requiring steady nerves and much patience has recently become popular in Paris. It is played with a rectangular glass-covered box having a portion of the bottom raised slightly above the remainder. The upper, circular part of the raised portion is provided with a number of holes or cups. A ball of mercury is placed in the box on the part marked A, and the purpose of the player is to roll the mercury over the portion marked B, and then successively over the holes in such manner as to fill them with mercury without the ball splitting up in several parts or any part of it rolling down into the lower portion of the bottom.

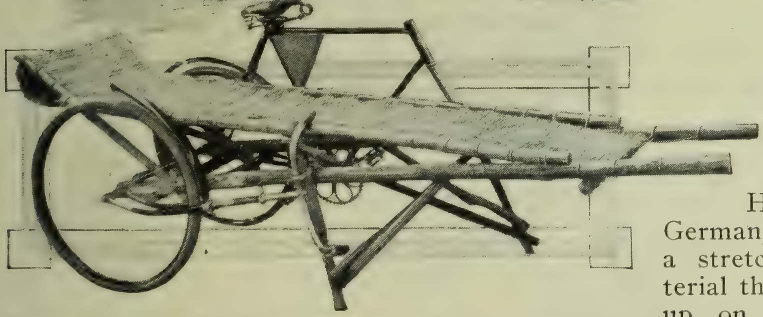
The difficulty increases, of course, the closer the holes are to the edge, and higher values are therefore given to these holes than to those nearer the center, the central hole having the lowest value.

To anyone who has observed the seemingly uncontrollable nature of mercury, it would appear almost impossible to play the game successfully, but it is asserted that with some practice all the mercury can be disposed of in the holes in three or four minutes.

WINNERS OF CZARINA'S RED CROSS PRIZES

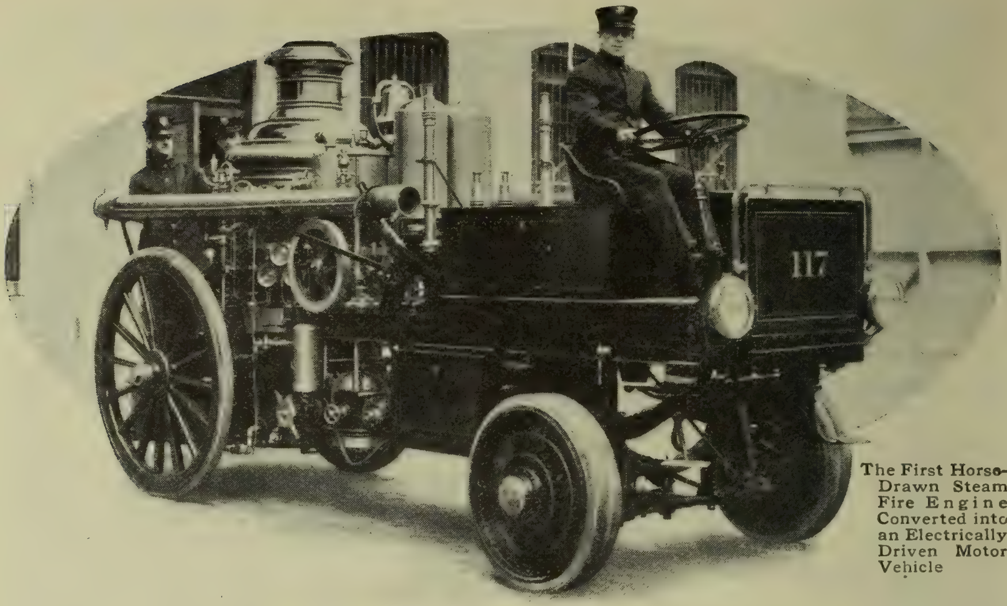


A Folding Stretcher Adapted to Various Modes of Transport, Invented by Major Riggenbach of Switzerland and Awarded a Second Prize



Stretcher Using Bicycle Wheels, and Made of Material Taken from the Field—Invented by Herr Steindorf of Germany, Awarded Second Prize

One of the important features of the International Red Cross Conference recently held in Washington was the award of the prizes given by the Empress of Russia for devices for the care of wounded on the field of battle. There were nine prizes in all, each consisting of a sum of money, the award being made by a committee of the International Red Cross. Dr. Louis Lesage, of the Necker Hospital, Paris, was given the first prize of $3,000 for an X-ray laboratory automobile designed by him. One of the two second prizes of $1,500 each was awarded Herr G. Steindorf, of Germany, his device being a stretcher made of material that might be picked up on a battlefield and mounted on the wheels of a bicycle. The other second prize was given Major Riggenbach, of Switzerland, for his invention of a folding wheeled stretcher that can be used for a variety of modes of transportation. Two American army surgeons, Maj. Paul. S. Halloran and Capt. Henry L. Brown, were among the six persons awarded third prizes.



The First Horse-Drawn Steam Fire Engine Converted into an Electrically Driven Motor Vehicle

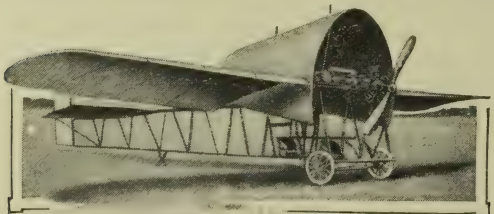
NEW YORK'S FIRST ELECTRIC FIRE ENGINE

Many old horse-drawn steam fire engines have been converted into motor-driven vehicles by equipping them with gasoline power plants, and their number is steadily growing, but the first fire engine to be converted into a motor vehicle by the installation of electric motors is now in operation in New York. Its runs average about one per day, and it has a speed of 20 miles an hour over smooth, hard roads, and takes grades with ease.

The weight of the engine before conversion was 9,800 lb., as compared with its present 15,000 lb. An 80-cell 11-plate battery is used, which will run the machine 20 miles on a single charge.

NEW FRENCH MONOPLANE PILOTED BY BOY

A new French aeroplane, known as the Jourdan monoplane, and piloted by Jean Jourdan, a boy only 16 years old, is shown in the accompanying illustration. It has a wing span of about 45 ft., a length of 32 ft., and is driven by a 70-hp. Gnome motor. The interesting feature of the design is the hooded central section.



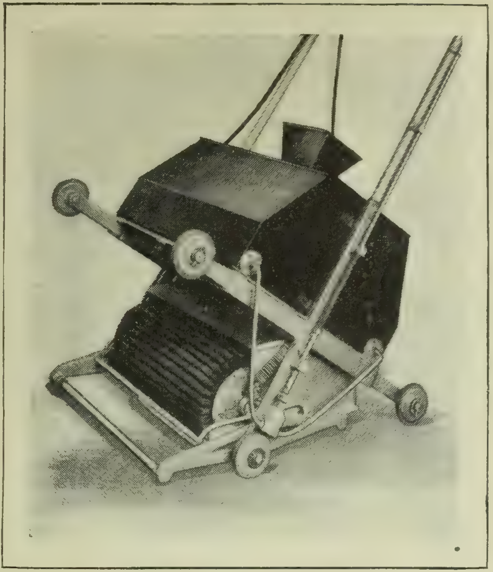
A Hooded French Monoplane Piloted by a 16-Year-Old-Boy

REVOLVING ELECTRIC FLOOR SCRUBBER

An electric floor-scrubbing machine, the brush of which is cylindrical in shape and revolves instead of being rotary in its action, has been successfully used in the Roosevelt hospital, New York. It was invented by an attendant of this hospital.

The machine supplies water to the floor which it scrubs and then takes up the dirty water. The water-supply tank holds about 5 gal. Under the tank is a ¼-hp. motor which drives the brush at a speed of 400 revolutions per minute. The brush is 7 in. in diameter, so its bristles travel about 700 ft. per minute, sweeping the water up into detachable receptacles. By a simple system of gears the brush can be adjusted to press lightly or heavily against the floor.

The machine works as well in either direction, thus obviating the necessity of turning it around. When the end or side of the room is reached all that is necessary is to swing the handle over. This reverses the action of motor and brush, and shuts off the clean water on one side and starts the flow on the other. The reversing of the brush also tends to keep the bristles straight.



A Revolving, Electrically Driven Brush for Scrubbing Floors

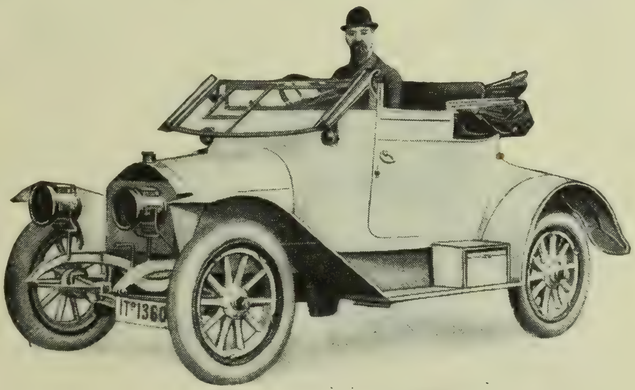
¶ Watermelon seeds are considered a delicacy in China and are served at meals much as salted almonds are served in the United States.

NEW "RAINBOW" ELECTRIC LAMPS

A multi-color or "rainbow" electric lamp is being marketed by an English concern. In general appearance it resembles an arc lamp, but it is fitted with an opal globe inside of which are three metallic-filament lamps of 25 cp., having red, blue and yellow globes respectively. Inside the case and immediately above the lampholders are three thermo-flashers, with adjustable platinum contact points, set to connect the lamps in and out of circuit, and in such a way that either one, two or three are alight at a time. With the different lamps going out or coming on, different combinations of colors are produced, which are evenly diffused by the opal globe. Inasmuch as the flashers are not synchronized, the colors are constantly changed. Of course, when only one lamp is alight, only the particular color of its bulb is shown.

GERMAN TWO-PASSENGER AUTOMOBILE BODY

A new two-passenger automobile recently delivered to Prince Gwoff, Germany, has an interesting type of body designed by a Stuttgart firm. This body can be so easily converted that it is a simple matter to operate the car either as a closed or open one, the mechanism effecting the conversion being of simple character. Either a baggage carrier or a rumble seat may be used at the back of the car.



A Two-Passenger Convertible-Body Automobile, Owned by Prince Gwoff, of Germany

"FACTORS OF SAFETY" IN LIVING CREATURES

By JOHN B. HUBER, A.M., M.D.

After the last Harvard-Yale boat race it was the losing crew which gave the greatest evidence of exhaustion. In one instance the Yale men were so utterly "all in" that they had to be lifted out of their boat. One might have expected just the reverse,—that the Harvard men, having taken the extra exertion necessary to win, had worked more nearly to the limit of their powers and should have been more played out than the Yale men in consequence.

But to think that way is not to take into account the stimulus of victory on the one hand, and the depressing effect of defeat on the other. It has been estimated that the mortality from wounds in a defeated army is in proportion to that of the victors as four to three or even as three to two. The science of psychology gives the explanation. Success brings into play the factors of safety in the living body; failure has the reverse effect to weaken these factors.

What, then, are those factors of safety? They are our reserve forces, which avail us in times of inordinate stress and strain; and they keep our bodies in fairly normal condition in spite of many injurious external agencies. The term was borrowed from the mechanical engineer by Dr. J. S. Meltzer, when he addressed the Harvey Society in New York City on the "Factors of Safety in the Animal Structure and the Animal Economy." The mechanical engineer deals with factors of safety in estimating the margin of safety required in constructing engines, bridges, houses, and so forth. In mechanics it is calculated that structures should be capable of withstanding not only the stresses of reasonably expected maximum loads, but also those of six or seven times such loads. The factor of safety is founded upon human ignorance of what might happen; and upon a wise desire to provide against such contingencies.

So, in the human machine, the potential energy of many organs, as the heart, for instance, far exceeds the needs of normal everyday humdrum existence. In the case of many of our functions the necessary mechanisms are doubled and even trebled. And the function of one organ is often assisted by other organs. Living tissues, such as make up our bodies, are abundantly provided with one factor of safety which is peculiar only to living things, and to no other kind of machinery—that is, the mechanism of self-repair. These factors of safety promote the integrity of life, the perpetuation of the species, and have an important bearing on the process of natural selection.

Nature is never stingy; indeed there never was a more extravagant dame; her gifts are far beyond the requirements of sentient creatures. The roe of a single fish, for example, often contains millions of potential fish lives; and if the law of the survival of the fittest became inactive for a single season no vessel could make its way through the fish that would choke up the ocean.

Medical history furnishes countless instances of physical endurance, apparently superhuman, that can be explained only by reference to factors of safety. For example: Who is not thrilled in reading how Napoleon led his army across the Alps, to the point where his troops believed themselves absolutely spent; not another step could they carry their panting bodies! But here that magnificent, though untutored psychologist, had his band play "La Marseillaise." Its strains amid those snow-capped heights were a mighty stimulus to courage and patriotism, whereby such reserve strength was awakened as the rank and file had not dreamed themselves possessed of; so that with triumphant shouts they finished the titanic task their determined general had laid upon them.

AN "S O S" BELL FOR WIRELESS STATIONS

While testifying at the "Titanic" inquiry in London Marconi told of an invention he is now perfecting that will cause an alarm bell to ring at all wireless stations receiving a danger signal sent out by a ship in distress.

By the ringing of this bell, an ordinary seaman stationed near the wireless apparatus of the ship while the operator is off duty would know that some ship was sending out a distress message and notify the operator. In order to make the idea effective Mr. Marconi says it would be necessary to alter the wireless regulations formulated by the international convention, so that the "S O S" danger signal could be accompanied by a long dash or sequence of waves, lasting for a period of 15, 20 or 30 seconds. This would cause the bell to give a prolonged ring, enabling anyone on duty nearby to know that a ship required assistance.

RUBBER OBTAINED FROM "TIRUCALLI" TREE

A new source of rubber has been found in the "tirucalli" tree of Natal, according to a French magazine. This tree has hitherto been regarded as commercially useless, and it was but lately discovered that it yields a juice which contains rubber.

A company was organized to work a concession in the Tugela Valley, and has been exporting about a ton a week of the crude material to London where it has been found useful for electrical insulation and for mixing with Para rubber. There are an unlimited number of "tirucalli" trees in Natal, and their recuperative qualities are so great that they can be tapped once a month.

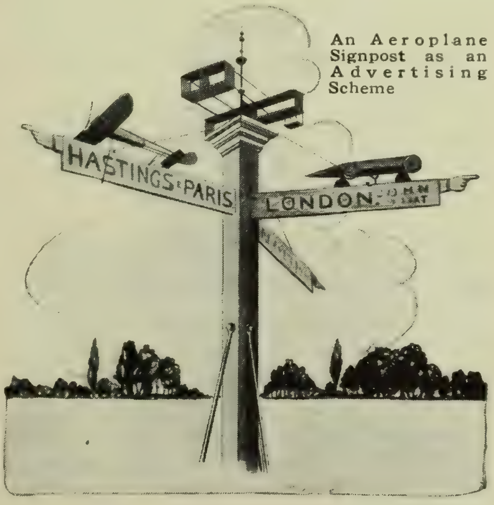
ELECTRIC DRIERS FOR HOSIERY

An electric method of drying and finishing hosiery has been developed by an electric company in the east for the use of stocking-manufacturing concerns and for laundries. The stockings are drawn over electrically heated forms which both dry and shape them.

A Battery of Electrically Heated Forms for the Drying and Shaping of Stockings

AN AVIATION SIGNPOST IN ENGLAND

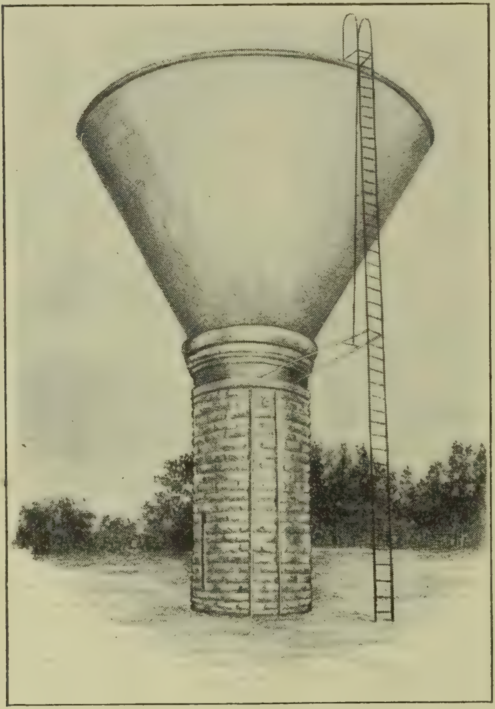
On the top of a motor-repair shop and garage at Bromley South, on the main road between Hastings and London, Eng., has been erected a unique



An Aeroplane Signpost as an Advertising Scheme aviation signpost. The summit of the post carries a small model aeroplane of the biplane type, while the direction arms carry a monoplane and a racing automobile.

FUNNEL-SHAPED CONCRETE WATER TANK

In Victoria, Australia, is a water tank the shape of which is probably unique among such constructions. The funnel-shaped tank, which has a capacity of 3,150 gal., is constructed of reinforced concrete, while the lower section is of brick masonry.



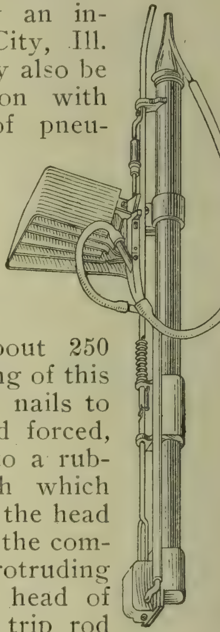
An Unusual Water Tank Constructed of Brick and Concrete

A SOUTH AFRICAN SHAFT-SINKING RECORD

A new record for shaft-sinking in the Rand mines has recently been made, according to the South African Mining Review. It states that the southeast shaft of the Government Gold Mining Areas Consolidated was sunk 233 ft. during March, exceeding the previous record of 213 ft., made at the Brakpan mines in July, 1907. Another record performance was the sinking of 583 ft. during the first quarter of the year at the State mines. The shaft measured 45 by 10 ft. and from it 8,155 tons of muck were removed during the month, equivalent to 35 tons per foot. The sinking was done between the 1,738-ft. and the 1,971-ft. levels through 155 ft. of rock and 78 ft. of shale. Natives did all the hand drilling and shoveling; 82 natives and a white assistant comprising the sinking crew for one shift.

PNEUMATIC HAMMER FOR DRIVING NAILS

A pneumatic nail-driving hammer, particularly designed for use by carpenters in nailing laths, has been patented by an inventor of Zion City, Ill. The apparatus may also be used in connection with various classes of pneumatic tools, such as rock drills.



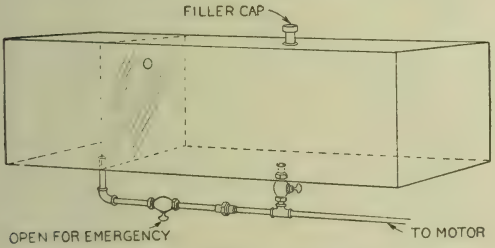
Attached to the tube containing the piston or hammer is a nail box or hopper, having a capacity of about 250 nails. The vibrating of this hopper causes the nails to be tripped up and forced, one at a time, into a rubber tube, through which they are forced to the head of the hammer by the compressed air. Protruding slightly over the head of the hammer is a trip rod which, when forced against the wall or object to be nailed, allows the nail to be set in the hammer head, and also releases the trigger which allows the compressed air to pass into the power chamber. The piston rod, striking the hammer, then drives the nail home.

The weight of the hammer is about 3½ lb., and a speed of 100 nails a minute can be attained.

Auxiliary Gasoline Tank for an Automobile

The regular supply tank on the automobile is fitted with a partition at such a distance from one end that the space thus provided will hold approximately 1 gal. of oil. About 2 in. from the top make a hole 1 in. in diameter and connect the compartments with pipes and fittings as shown.

Gasoline overflows into the auxiliary tank when the main tank is filled. This provides a reserve supply of 1 gal. of oil, which will run a car at least 10 miles. As the tank is automatically filled, it requires no attention except when the supply in the main tank runs out, then, if one happens to find himself where no oil can be obtained, the emergency valve is opened and the reserve supply used.—Contributed by James McCaffrey, Pawtucket, R. I.

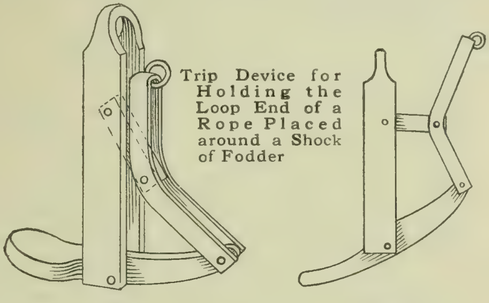


The Small Auxiliary Tank is Automatically Filled and Kept Ready for an Emergency

Aid in Mowing Fodder

It is often necessary to put shock fodder in a mow, and by loading the shocks whole, looping a rope around each and attaching the apparatus shown in the illustration in place of the regular hayfork, the fodder can be handled as easily as hay.

The device is shown set to receive the loop end of the rope in Fig. 1, and tripped, in Fig. 2.—Contributed by Stanley M. Hadley, Danville, Ind.

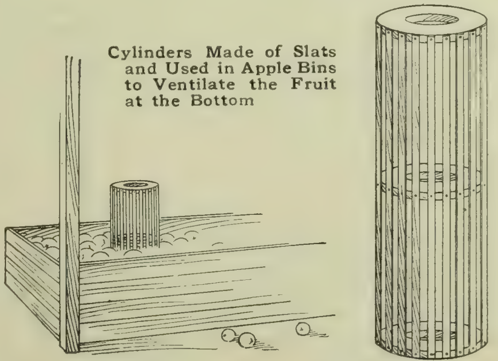


Trip Device for Holding the Loop End of a Rope Placed around a Shock of Fodder

Fig. 1 Fig. 2

Ventilating Apple Bin

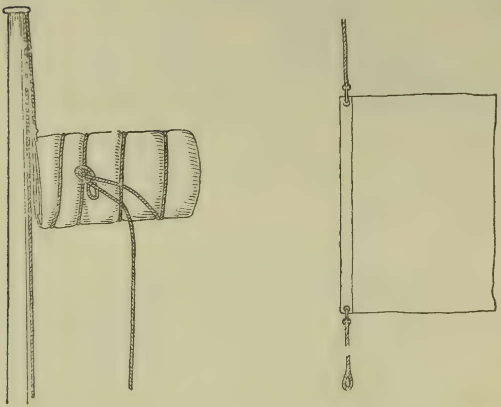
Apples placed in large bins will not keep well, unless they are well ventilated. Effective ventilation can be accomplished by making cylinders of slats and placing two of them in a bin 8 ft. square. The disks for the cylinders are 12 in. in diameter with holes in the center, as shown in the sketch. The manner of using the cylinders is obvious.—Contributed by R. L. Keenan, Sabula, Iowa.



Cylinders Made of Slats and Used in Apple Bins to Ventilate the Fruit at the Bottom

Raising a Flag

The proper method of storing and raising flags, ensigns, etc., is illustrated in the sketch. The manner of rolling a flag for storing is shown in the first sketch, while the second shows the usual equipment for a flag. The flag is attached to the signal halyard with a snap hook in the upper grommet. The grommets are fastened to the canvas heel of the flag.


The Rope as It is Tied about a Folded Flag for Raising It to the Top of a Pole

The flag is made up as shown in the first sketch and when hoisted to the truck, a pull on the down haul releases it and allows the flag to break out. A number of flags may be made up in this manner and be broken out simultaneously, or they may be hoisted and broken out one at a time by doing each one up separately. A sharp pull on the down haul will then release the lower one, another pull, the next one, etc. The flags should be stored away all rolled up as in the first sketch.—Contributed by Geo. M. Petersen, Buffalo, N. Y.

Cleaning Gun Barrels

Lead and powder residue as well as rust can be easily removed from rifle and gun barrels, and if the barrel is not badly pitted, it can be restored to its original brightness and cleanness by using ordinary steel wool in cleaning. Take a wad of the steel wool just as large as can be conveniently drawn through the barrel and attach it to a stout cord or a small wire and draw it back and forth in the barrel. All rust and residue will be thoroughly removed from the barrel in a few minutes.

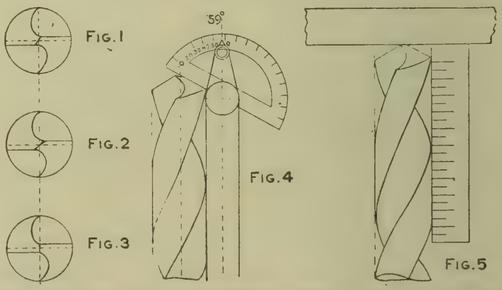
The steel wool will not scratch or injure the barrel in the least. The No. 0 steel wool is the most desirable to use, and it can be obtained at almost any hardware store.—Contributed by H. A. Jonset, Faulkton, S. Dak.

Grinding Twist Drills

Few operations on tools in the shop are more frequently disappointing than the grinding or sharpening of drills. That the cutting edges have a correct and uniform angle with the longitudinal axis of the drill, that they be exactly equal in length, and that the lips of the cutting edges be sufficiently backed off or cleared, are points generally understood as essential, though not always attained.

If the clearance of a drill is insufficient or imperfect, it will not cut. When force is applied, it resists the power of the machine and is crushed or split. After grinding a drill by hand, it is well to start it and observe the character of the chips.

The grinding lines of a drill are placed slightly above the center to allow for the proper angle of the point, which is an important factor. This angle is an index of the clearance. If the angle is too great, the drill will not cut right; if too small, it may not cut at all. The proper angle is shown

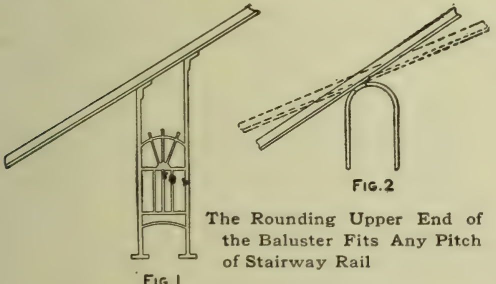


A Drill must Have the Cutting Edge with the Proper Angle and Clearance to Produce a Perfect Hole in Fig. 1. Too sharp an angle is shown in Fig. 2, and an angle that lacks clearance is shown in Fig. 3. Drills properly ground have their cutting edges straight when ground to the proper angle, which is 59 deg., as shown in Fig. 4. Grinding to a less angle leaves the lip hooking, which is likely to produce a crooked or irregular hole.

An effective method of determining the clearance is to set the point of the drill on a plane surface and hold the scale as shown in Fig. 5. The clearance is easily shown by revolving the drill. This will also show whether the height of the cutting lips and the length of the cutting edges are equal. In grinding a drill, preserve its original form which will usually insure rapid and satisfactory work.—Contributed by W. H. Addis, Lafayette, Ind.

Baluster Design to Fit Any Pitch of Stairway

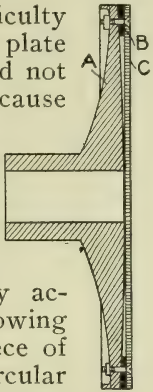
In making cast-iron balusters for stairways, the general construction of which is shown in Fig. 1, I found that scarcely any two flights of stairs had the same pitch, and the workmen constantly had to change the pattern to suit the pitch of stairs. As this work caused considerable expense, I designed a baluster that could be made up and carried in stock ready to fit any pitch of stairway. The general design was not changed, but the upper end, to which the rail is attached, was made semicircular in outline, so that it would fit any pitch of rail, as shown in Fig. 2.—Contributed by Jas. F. Napier, Montreal, Can.



The Rounding Upper End of the Baluster Fits Any Pitch of Stairway Rail

Repairing a Worn Friction Disk on an Automobile

The aluminum disk A on my friction-drive automobile became worn around the edge, which prevented the necessary pressure at the rim of the disk.



To overcome this difficulty I undertook to build the plate up true. The metal could not be dressed off true because this would make it too thin, and furthermore it would be too expensive as the machine would have to be taken apart.

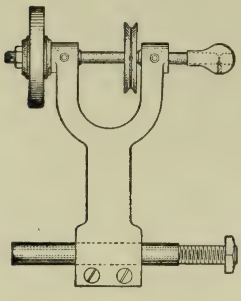
The repair was easily accomplished in the following manner: I secured a piece of saw steel, C,—an old circular saw would answer well—about $\frac{3}{16}$ in. thick, and drilled $\frac{3}{16}$-in. holes through the steel, ¾ in. from the edge, countersinking the holes to receive $\frac{3}{16}$-in. tire bolts.

The space between the disk A and the plate C was filled with a paper friction ring at B, thick enough to let the steel plate just touch the center. The parts were clamped together and the holes continued through the paper ring and the aluminum disk. Tire bolts were put through the holes and drawn up evenly all around and the heads filed off even with the surface of the plate. The bolts should be cut off short and burred to prevent the nuts from backing off. The repair cost about $3, while a new disk would have cost $15. The steel gives better satisfaction than the aluminum.—Contributed by Chas. A. Pettit, Rossville, Maryland.

Cleaning Brass

Small brass castings can be cleaned by heating them slightly and then dipping them in a solution of sal ammoniac. The pieces will come out as bright and clean as if new. This cleaning process is the same as that used in cleaning a soldering iron.

Truing Collector Rings



The machine shown in the sketch was fitted up by a correspondent of the Engineer for truing up badly worn collector rings on a compensated revolving field alternator. He descibes its operation as follows:

The emery wheel is passed across the rings while the machine is running slowly. The wheel is run at a speed of 3,000 revolutions per minute by a small motor. It puts the rings in fine shape and saves taking the head to a machine shop. Then, too, while turning the rings, they are liable to get out of place. Strips are bolted in the place of the brush holder and the rig clamped to the bolt by two screws, the bottom of the casting being split to insure a tight grip, will serve the purpose.

ℭAn easy way to trap vermin is to place an ordinary steel trap in the center of a tile, placed in such a position as to serve as an entrance to their prey.

How to Build a Motorcycle Garage

The owner of a motorcycle does not always have a suitable place to keep his machine. The hall or back porch affords no place and the basement air is usually too damp, and rusts the metal parts as well as being injurious to the tires. The need of a small garage, in which there is ample room to do small repairs, is realized by most riders, but few know that the material for a small house can be bought for less than $25.

The average rider is usually mechanically inclined, at least sufficiently so to be able to build a small garage, if suitable plans are at hand. While the following material list and accompanying plans are for a house 6 by 8 ft., the builder can alter them if a larger garage is desired, but it must then be taken into consideration that the cost increases more rapidly than the length of the boards and timbers.

The sill foundations are built up of brick or stone, preferably red brick, on the place selected for the garage. The foundations are located at each corner and under each stud. Care should be taken to have the tops of the foundations level and high enough

LIST OF MATERIAL FOR A 6 BY 8-FT. GARAGE

SILLS
2 pieces, 2 by 4 in., 8 ft. long.

JOISTS
6 pieces, 2 by 4 in., 6 ft. long.

STUDS
10 pieces, 2 by 4 in., 6 ft. long.

NOGGING PIECES
2 pieces, 2 by 4 in., 8 ft. long.
2 pieces, 2 by 4 in., 6 ft. long.

PLATES
2 pieces, 2 by 4 in., 8 ft. long.
2 pieces, 2 by 4 in., 6 ft. long.

RAFTERS
12 pieces, 2 by 4 in., 6 ft. long.

BENCH MATERIAL
1 piece, 2 by 4 in., 10 ft. long.
2 pieces, 2 by 4 in., 6 ft. long.
5 pieces, 2 by 6 in., 6 ft. long, S-4-S.

SIDING AND ROOF
Sufficient tongue-and-grooved boards, S-4-S, to cover 300 sq. ft.

FLOOR
Sufficient tongue-and-grooved boards to cover 50 sq. ft.

ROOFING
Sufficient prepared roofing material to cover 120 sq. ft.

FINISHING MATERIAL
4 fascia boards, S-4-S, 1 by 4 in., 6 ft. long.
2 door facings, 1 by 4 in., 6 ft. long.
1 door header, 1 by 4 in., 3 ft. long.
2 pieces for window facings, 1 by 4 in., 6 ft. long.
7 corner boards, 1 by 4 in., 7 ft. long.

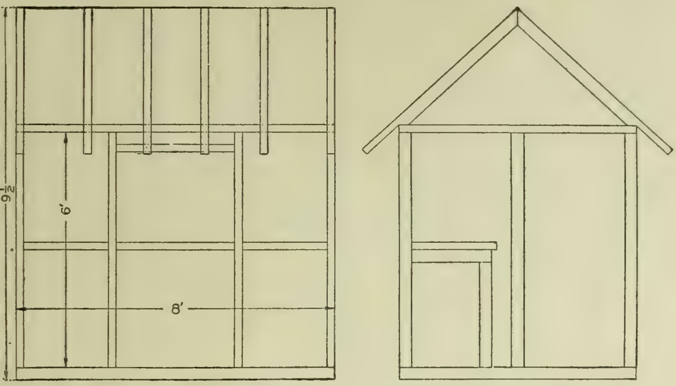
WINDOW
1 single casement.

DOOR
1 paneled door, 2½ by 6 ft.

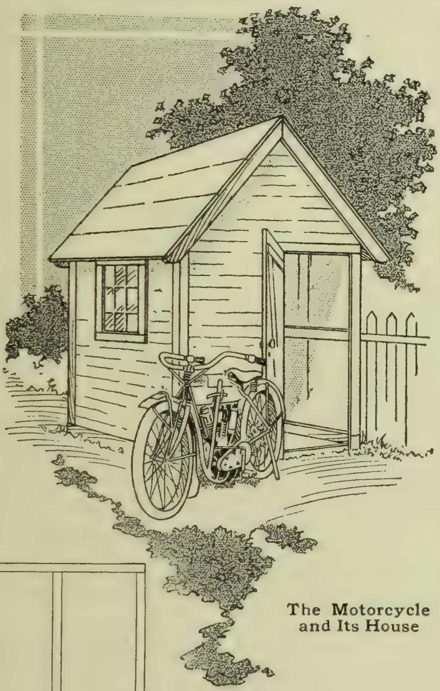
HARDWARE
1 pair of door hinges.
1 pair of window hinges.
1 window bolt.
1 door lock.
4 lb. of 20-penny nails.
8 lb. of 8-penny nails.

to prevent rotting of the lumber from the moisture of the ground.

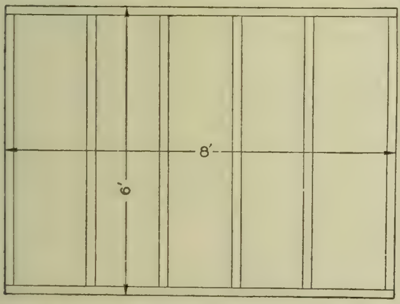
Cut the sills and joists to length, taking into consideration that allowance must be made on the joists for the thickness of the sills, to make the over-all measurement 6 ft. in width. In some instances the joists and sills can be notched, but a more substantial way is to cut them as shown in the floor plan and drive large spikes through the sills into the ends of the joists.



Side and End Elevation, Showing the Location of the Bench



The Motorcycle and Its House



Floor Plan in Which the Two Sills are Shown Spiked to the Ends of the Joists

The 10 studs are cut to length and the pieces for the plates mitered on the ends. The location of the studs are marked on the sills and end joists, the two intermediate studs being set so that their inner surfaces, which receive the window sash, are each 30 in. from the end, or outside. After marking the locations for the studs on the joists and sills, the plates are marked to match them and then spiked to the upper ends of the studs. The two sides are raised first, and the studs toe-nailed to the sills, then plumbed and braced temporarily. The ends are raised in the same manner, the stud in each being set in the center. The mitered corners of the plates are spiked in a manner similar to that in which a picture frame is nailed together. The nogging pieces are cut to fit in between the studs and fastened on them halfway between the top and bottom.

The roof is a half-pitch and the rafters are cut on a miter at the upper ends, the lower ones being notched out to form a projection for the eave. The two end pairs of rafters are fastened on the plates and plumbed with their outside surfaces at right angles to the outside of the end studs. The other four pairs are spaced evenly between them.

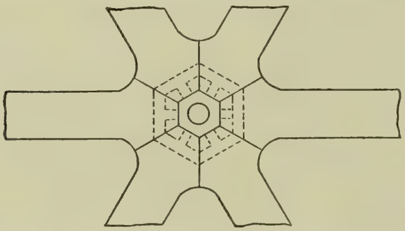
In nailing on the roof boards, the work should be begun at the bottom, and 1 ft. of the boards should be allowed to project over the end rafters. The boards are then covered with the prepared roofing.

The siding boards are nailed on in a vertical position, allowing openings for the door and window. The door is so hung on the center end stud that it swings outward.

The bench is built up level with the nogging pieces on the side having the window. The crosspieces, holding the top planks of the bench, are spiked to the studs just under the nogging pieces, and the inside ends are supported on posts. The planks are spiked to the crosspieces.

To Hold Spokes of Wheels in Wood Patterns

The spokes in a pattern for a wood wheel are very difficult to fasten at the hub so as to make them hold like one piece. I use the method shown in the sketch, which not only draws them tightly together, but holds them firmly. This method is very simple. A hole is bored through the end of each spoke and another hole bored to intersect it at right angles, as shown by the dotted lines. After the spokes are in position melted babbitt metal is run into the holes. As the metal cools it shrinks, thus drawing the joints closely together.—Contributed by Chas. R. Poole, Los Angeles, Cal.



The Metal Forms a Hexagon Which Holds the Ends of All the Spokes

Water from a Drainpipe Leak Absorbed with Brick

An emergency call to repair a leak in the drainpipe under the bathroom floor of a fine residence, came to our shop just as we were leaving on Saturday evening. Upon examination it was found that a permanent repair could not be made without putting in a new piece of lead pipe and wiping at least two joints.

We decided to try to leave the job if possible until the next workday. The leak was closed as much as possible by hammering the metal, but we could not close the aperture to keep it from leaking. The drops were noted and it was estimated that a pint would leak out in about 12 hours. As there was a space only about 4½ in. between the pipe and plaster and an opening in the floor, 4 by 12 in. in size, it was out of the question to get a pan large enough under the leak to hold the water.

When looking around in the basement we found a pan, 1 in. deep and 9 by 12 in. in size, also some dry soft brick. We placed the pan on the plaster and the brick in the pan. For two days the brick absorbed the water as fast as it dropped from the leak. This method can be used by plumbers in many places.—Contributed by C. H. Bierly, Zanesville, O.

Cutting Piston and Valve-Stem Packing

The sketch illustrates a simple device for cutting round or square ring piston or valve-stem packing. It is always a more or less difficult matter to cut the ring exactly correct in length, to say nothing of getting each end the proper angle so that they will match when closed around the rod. This wood gauge or mandrel obviates all difficulties, giving size of packing, size of rod and angle of cut. The sawed slot, Fig. 1, for cutting may be at any angle desired. The cut is made as shown in Fig. 2. This little device will save the engineer much valuable time, as usually several rings of packing are cut and thrown away before the proper size has been obtained.

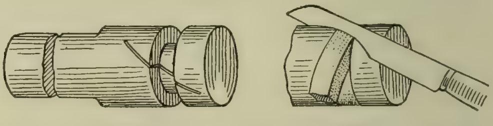


Fig. 1 Fig. 2

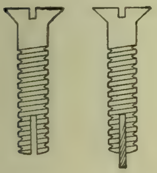
The Wood Mandrel with Knife Slot and Packing Groove and Manner of Cutting Packing

How to Clean Portable Farm Engines

This method of cleaning farm engines is from the Thresherman's Review: Dissolve 1 lb. concentrated lye in about 2 gal. water, and with a mop saturate the engine with the liquid, being careful that it does not get into the oil holes of the journals and bearings. After the lye has eaten all the grease and gum from the surfaces, clean thoroughly by scraping and brushing, and after the iron is dry and free from grease, apply a thin coat of lead paint. When this is perfectly set, paint the iron a deep black and varnish heavily. Coloring, striping or decorating should be done before varnishing. Then the engine can be easily and quickly cleaned with a dusting cloth, and escaped oil can be wiped off.

To Make Worn Threads of a Bolt Hold

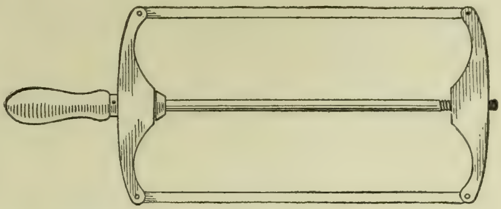
Where it is necessary to use a screw or bolt having worn threads, slot the threaded end and drive a flat wedge into the opening as shown in the sketch. This will make the bolt or screw hold almost as well as if new threads had been cut on it.—Contributed by Edward Matthews, New York City.



Double-Blade Hacksaw Frame

The purpose of the double-blade hacksaw frame shown in the illustration, is to dispense with extra frames for holding saw blades of different grades of fineness. This frame will hold a coarse and a fine-tooth blade at the same time.

The crosspieces carrying the blades are made of brass, 5 in. long, and the center rod is of steel, 3/8 in. in diameter and 12 in. long. A flange is brazed on the rod just in front of the crosspiece at the handle. The other end of the rod has a long thread to fit in a threaded hole of the end crosspiece. This is for drawing the blades tight by turning the handle. The blades are held in slots with pins, in the usual manner.—Contributed by P. H. Tierney, Lynn, Mass.



Two Blades are Placed in the Frame and Tightened Equally by the Handle on the Rod

How to Measure a Resistance with a Voltmeter

A voltmeter, whose resistance is known, and some source of electrical pressure are all that is required to measure a resistance by this method. The voltmeter is first connected across the terminals of the source of pressure and the value of the total pressure in volts determined. It is then connected in series with the resistance to be measured, and the combination connected to the source of pressure. The connections of the voltmeter for measuring the total pressure are shown in Fig. 1 by the dotted lines, and the full lines indicate the connections when the unknown resistance is in circuit. The first reading of the voltmeter, which is the total pressure, we shall call E_t, and the second reading, or the one obtained when the voltmeter is in series with the unknown resistance, we will call E_v. Assuming the total pressure to remain constant, the

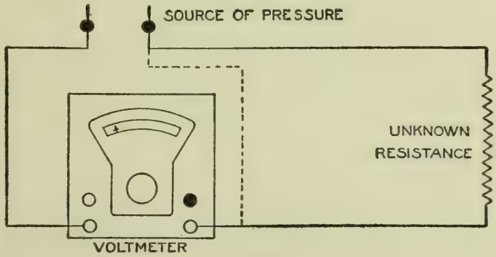


Fig. 1

The Ordinary Wiring Diagram and the Connections of a Voltmeter for Measuring the Total Pressure

pressure over the unknown resistance, which we will call E_x, can be determined by subtracting the value of E_v, from the total pressure, E_t, or

$$E_x = E_t - E_v$$

In any series circuit in which there is a direct current, the drop in pressure over the various parts bear the same relation to each other as exists between the resistances of these parts. Since the resistance of the voltmeter, R_v, the drop in pressure over the voltmeter E_v, and that over the unknown resistance, E_x, are all known, we can determine the value of the unknown resistance, R_x, by substituting in the following equation:

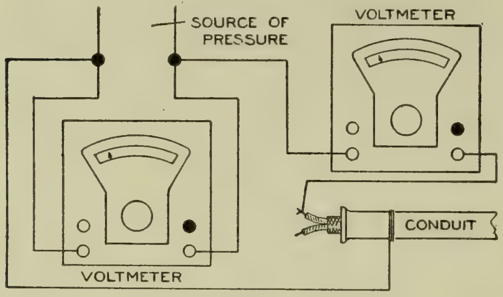


FIG. 2

Connections for Measuring the Insulation Resistance between a Circuit and the Conduit in Which the Circuit is Placed

$$\frac{E_v}{E_x} = \frac{R_v}{R_x}$$

Solving this equation for R_x gives

$$R_x = \frac{E_x \times R_v}{E_v}, \text{ and}$$

since $E_x = E_t - E_v$, we have

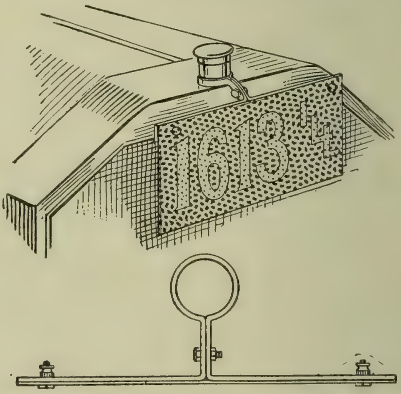
$$R_x = \frac{[E_t - E_v]\,R_v}{E_v}$$

This method of measuring resistance is usually employed in determining the value of high resistances where a very great degree of accuracy is not required, such as the insulation resistance of a lighting or power circuit, insulation resistance between the field or armature windings of a machine and the metal parts of the machine, etc. The connections for measuring the insulation resistance between a circuit and the conduit in which the circuit is placed, are shown in Fig. 2. Each wire can be measured separately, and the side having the greatest leakage should be connected to the terminal of the generator that is permanently grounded, if one side is grounded. By making the connection as indicated above, the leakage on the line will be less than if the connections be reversed.

The nearer the resistance of the voltmeter to the value of the unknown resistance, the more accurate is the result. If the value of the total pressure is continually changing, two voltmeters should be employed, one being permanently connected across the source of pressure, and the other in series with the unknown resistance. The resistance of the voltmeter across the line need not be known.

License-Number Holder for an Automobile

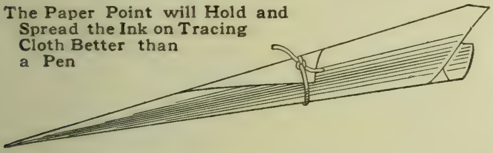
The new perforated license numbers are intended to be placed in front of the radiator on an automobile. A much neater method than the old way of fastening it close to the radiator with wire, is to make a bracket from a piece of band iron, which is easily bent to the shape desired. It should be made in accordance with the pattern in the sketch, but the dimensions will, of course, be governed by the size of the tag and of the radiator water cap. Three holes are drilled after the



The Perforated License Tag is Held Firmly and Clear of the Radiator by the Bracket strip has been cut and bent to shape, one through the double strip between the loop and straight part, and one at each end, as shown. Small bolts are used in these holes for attaching the tag to the bracket, and to hold the bracket on the filler cap.—Contributed by E. K. Marshall, Oak Park, Ill.

Ink Fountain for Covering Large Surfaces on Tracings

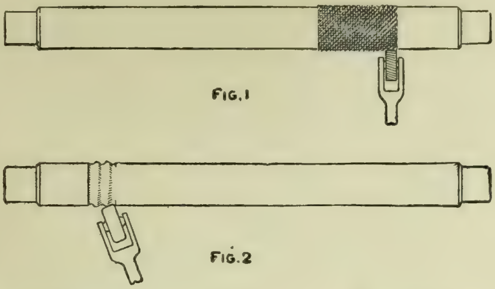
Draftsmen sometimes find it necessary to cover considerable spaces, such as wall sections, shadows, etc., with ink. To do this with a pen is very tedious work and also injures the tracing cloth. A brush is not always obtainable, but a scrap of paper can be had anywhere. Roll the paper up into a sharply tapering cone, as shown in the illustration, and tie it when a good point is obtained. This will make an implement for spreading ink which is far better than a brush. Dip the point into the ink and apply it to the parts to be covered.—Contributed by R. F. Pohle, E. Lynn, Mass.


The Paper Point will Hold and Spread the Ink on Tracing Cloth Better than a Pen

Sizing Mandrels

It often happens that a mandrel may be necessary for a certain repair job, when there is none at hand to fit the work. The old method of enlarging a mandrel, when found a little too small, was to cover its surface with center-punch marks. I find, however, that the two methods now to be described are far superior to the use of center-punch marks.

In the one shown in Fig. 1 a common knurling tool is used on that part of the mandrel where the close fit is required. The second, Fig. 2, is to roll a series of grooves or corrugations with the corner of a roll, such as is used to finish axle journals. In either method, the enlarging of the mandrel is supposed to be accomplished without any tempered or casehardened surface, so that the metal will be shaped by the rolling process.



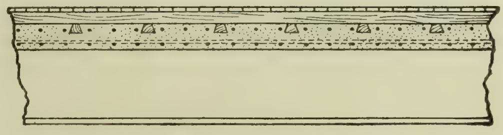
Mandrels may be Enlarged a Trifle by Knurling or Rolling Corrugations on Their Surfaces

The knurling method has been successfully used to enlarge bushings that were turned too small.—Contributed by J. H. Maysilles, Rochelle, Ill.

Wood Top on a Concrete Floor

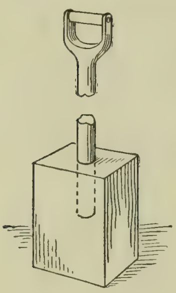
The accompanying sketch shows a concrete floor designed for use in a yarn mill. The problem was to provide a floor, resting on concrete, to which machinery could be easily and securely attached, says a correspondent of Industrial Engineering.

Planed, dovetailed nailing strips, or sleepers, 2 by 3 in., were accurately set with centers 18 in. apart, and concrete was poured around them, so as to completely fill the space beneath, and lock them into the mass of the slab. The illustration shows the sleepers and one system of reinforcing bars in cross section, and also shows how the sleepers were placed, without interfering with the reinforcing scheme, parallel to the bars of the upper course, and with three bars to each space between sleepers. The ends of the bars were


Wood Strips Molded in the Concrete to Make Holders for the Flooring Nails

butted halfway between the sleepers, and they were even nailed thereto with two 4-in. nails at each bearing. On top of the planking, and at right angles to it, was laid a floor of $\frac{7}{8}$-in. square-edged maple. Machines can be readily and firmly attached to this floor by lag screws. It has a degree of elasticity not possessed by concrete, and is much more comfortable for the workers.

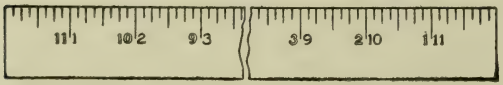
A Homemade Tamper



A serviceable tamper can be made of an old shovel handle and a block of wood. The block can be of any convenient hard wood, about 6 in. square and from 12 to 16 in. long. Bore a hole in one end of the block to receive the round part of the shovel handle. The handle is sawn off, inserted in the hole and securely nailed. The end of the block is covered with a piece of sheet metal.—Contributed by Otto Kling, Ada, Ohio.

Reading Rules from Both Ends

Desk rules and folding rules are made with the figures reading from left to right and sometimes, when measures have to be taken from right to left, it is inconvenient, if not awkward, to read off measurements without error. I have adopted a plan by which the figures on rules can be read either way. With a small plane I cut off the figures on my desk rule and substituted open-faced figures from right to left, to the left of each line indicating inches, and for the reading from left to right full-faced figures were put on, so as to make a distinction and prevent errors. These two rows of figures could also be made in different colors.—Contributed by R. Roy, Ottawa, Can.



The Numerals Marking the Inches on a Rule Run Consecutively Beginning from Both Ends

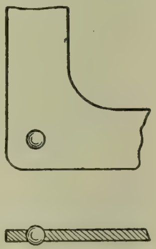
To Fit Loose Piston Rings

The piston rings in my motorcycle engine became worn so that there was an up-and-down play of about $\frac{1}{32}$ in., causing the engine to knock and lose compression. As I did not care to stand the expense or take the trouble of fitting new rings, I remedied the difficulty in the following manner:

Some thin rings cut from sheet metal were fitted in beside the old rings, care being taken to have them the same diameter to prevent scoring the cylinder. The engine runs as smoothly and quietly as when new.—Contributed by C. F. Rowe, Stephentown, N. Y.

To Keep a Protractor from Soiling a Drawing

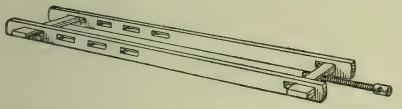
Every draftsman realizes how difficult it is to keep drawings clean while working on them. The principal source of trouble is the excess of lead deposited from the pencil, which is spread over the surface of the paper by the triangles, straightedge (or T-square) and protractors. The worst offender in this respect is the steel protractor, on account of its weight and true flat surfaces.



The best way to overcome this difficulty is to decrease the amount of surface contact with the paper. This is accomplished by drilling three small holes in the protractor to receive $\frac{1}{8}$-in. steel balls tightly. The protractor being only .12 in. thick, the balls will project a trifle on each side. This arrangement gives a minimum surface contact, yet keeps the instrument close enough to the paper to admit of accuracy and speed.—Contributed by J. C. Wilson, W. Lynn, Massachusetts.

Equalizing Clamp for Spring Hangers

A very handy device for use in railroad shops for equalizing spring hangers is shown in the sketch. It is constructed of two bars, ½ by 3 in. by 5 ft., and two crosspieces. The bars have slots, cut to coincide with each other, to receive the crosspieces, which are 1¼ by 2 by 7 in. One of the crosspieces is fitted with a screw as shown. This device will clamp a spring hanger and hold it while making necessary repairs.—Contributed by A. A. Attheide, Evansville, Ind.

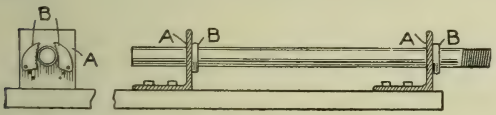


The Bars and Crosspieces in Their Positions as if on a Spring Hanger

Homemade Pipe Vise

As I had some pipe to cut and thread and no vise to hold the pipe, I made a temporary arrangement of angle iron that served the purpose well. The two pieces, A A, were cut from the end of an angle iron and holes drilled through one side of each to receive the largest pipe I had to cut. The angle irons were fastened to the bench about 2 ft. apart, with ½-in. bolts.

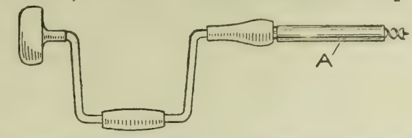
Two dogs, B, were attached to each piece of angle iron. Three holes were drilled for each dog so that they could be adjusted to receive and hold smaller pipes. The holes in the angle irons were fitted with bushings for smaller pipes.—Contributed by Stanley S. Zimmy, Harvey, Ill.



The Pieces of Angle Iron as They are Attached to a Board or Bench

An Auger Stop

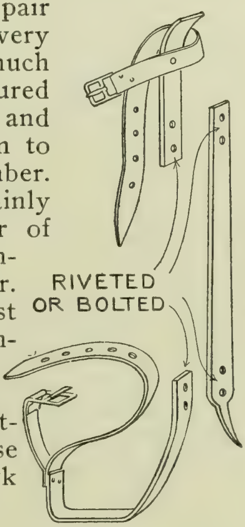
The stop is made of a piece of pipe, A, that will slip over the bit and of a length to stop the bit when it has entered the material to the desired depth. This is an effective stop to prevent an auger from passing too far through the material, and also to enable the operator to clean the edge of the hole by continuing to turn the auger after the stop strikes the surface of the material. A few pieces of different lengths and of a size to slip over the bits will be found very useful.



The Stop on an Auger Bit to Prevent It from Boring a Hole too Deep

How to Make a Pair of Climbers

Finding myself in need of a pair of pole or tree climbers, I came to the conclusion that a pair could be made very easily without much expense. I procured six old 10-in. files and used three of them to make each climber. The illustration plainly shows the manner of shaping and fastening them together. The files are first heated and bent into shape, then thoroughly annealed. — Contributed by Ambrose Zierck, New York City.



Aluminum Polish

An emulsion of equal parts of rum and olive oil can be used for cleaning aluminum, says Blacksmith and Wheelwright. Potash lye, not too strong, is also effective in brightening aluminum, and benzol can be used for the same purpose.

A good polish for aluminum consists of a paste formed of emery and tallow, the finish luster being obtained by the use of rouge powder and oil of turpentine.

Lighting a Match in the Wind

The accompanying drawings illustrate two methods of lighting a match in the wind. The match box as shown in Fig. 1 is used as a shield, the thumb being pressed on the head ends of the matches within the box, to prevent igniting them. In Fig. 2 an envelope is used to shield the flame from the wind. —Contributed by James M. Kane, Doylestown, Pa.

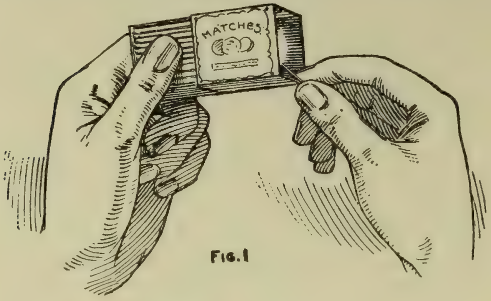


Fig. 1

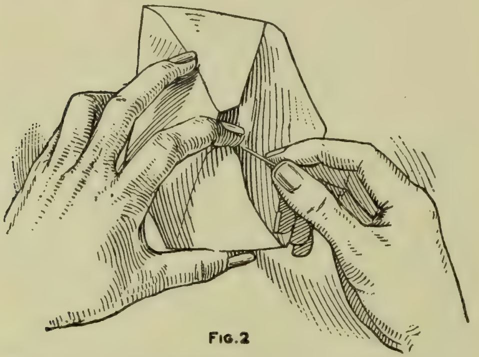


Fig. 2

Two Methods of Keeping the Flame of a Match Burning in a Strong Wind

Saving Gold with Oil

The fact that oil can be used for the purpose of saving filings and other small particles of gold and other precious metals, in jewelers' shops, is probably not generally known. It can be easily demonstrated by filling a glass half full of water and pouring kerosene on top of the water to a height of about 1 in. If then some very fine gold particles are dropped into the glass, it will be found that they will lodge at the water line.—Contributed by Wendell Rice, Caldwell, Idaho.

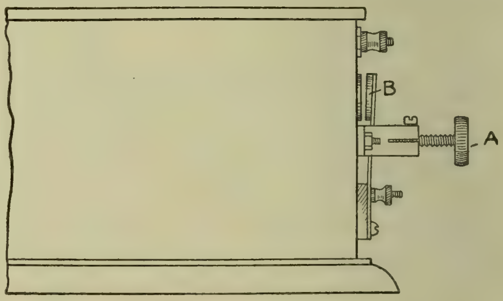
How to Adjust a Spark Coil

A recent careful investigation of a large number of so-called battery complaints on automobiles, led to the discovery that more than 90 per cent of them were due to an improper adjustment of the spark coil. The first thing the average motorist does when his car is not acting right, is to change the adjustment of the coil, and then when no spark is produced he blames the battery, when in reality the cause of the original trouble was elsewhere. A half turn of the adjusting screw on a coil will often increase the current required by the coil from one-third of an ampere up to one and one-half ampere, or nearly five times the actual current required.

A wrongly adjusted coil will cause one or more of the following cases of trouble: Great reduction in useful life of the batteries; rapid deterioration of the contacts on the coil; unsatisfactory operation of the motor; general dissatisfaction on the part of the operator.

Adjust the coil according to the following directions, and do not allow anyone to change the adjustment for any reason whatever:

First, remove the vibrator contact screw, marked A in the accompanying illustration. Second, smooth the point of the screw A and the platinum surface on the vibrator spring with a very fine file or a piece of very fine emery paper. Third, adjust the vibrator spring so that the hammer or piece of iron on the end of the vibrator spring stands normally about $\frac{1}{16}$ in. from the end of

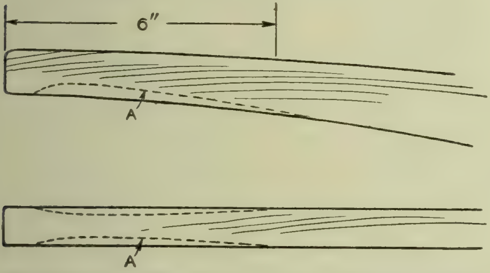


End of the Spark-Coil Box with the Vibrator Parts and Binding Posts for the Line the coil. This piece of iron is marked B in the illustration. Fourth, turn in the contact screw until it just touches the platinum contact on the vibrator spring very lightly, then start the engine and if it misses, tighten, or turn in the contact screw corresponding to the cylinder that is missing, just a very small amount at a time, until the engine runs without missing explosions.

If the carburetor is properly adjusted and the coil windings and circuits are in good shape, there will be an ample spark with the smallest possible consumption of battery energy. A high-grade coil will usually save its price in one season, through the economy effected in batteries.

Handle Shapes for Wheelbarrows

If the handles of a wheelbarrow are altered to the shape shown by the dotted lines AA in the sketch, a grip for the hands will be provided that greatly assists the laborer and causes fewer blisters than the ordinary handle.

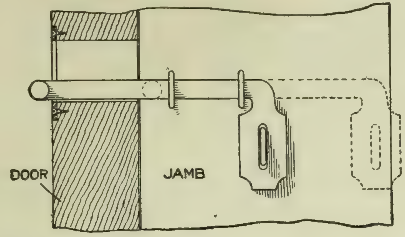


The Handles are Dressed to a Shape Similar to That of an Ax Helve, Producing a Knob on the End

The cause of its superiority seems to be the knob on the end which is similar to that on an ax helve. The tops of the handles are left untouched, the sides are sheared off for about 6 in. so as to give them an oval instead of a circular cross section. The under side is still more changed. About ¾ in. from the end of the handle the wood slopes sharply, showing a difference in circumference of about 1 in. between the knob and the smallest part. From this point it gradually slopes to the normal size at about 6 in. from the end.—Contributed by S. H. Packard, Boston, Mass.

A Sliding Door Lock

A very simple sliding door or gate lock that has been used with satisfaction is shown in the illustration. This lock has a feature that is not found in most locks of this character—that of keeping the door tightly against the jamb besides locking it. The illustration shows the bolt in a locked position ready to receive a padlock.

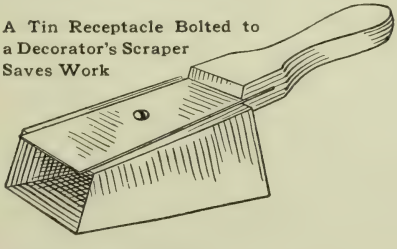


The Bent End on the Bolt Holds the Door Tightly against the Jamb When in a Locked Position

To operate the lock, lift the hasp from the staple bringing the bent end of the bolt in line with the slotted hole in the door. This will allow the bolt to be drawn through and left in an unlocked position, as shown by the dotted lines.—Contributed by W. H. Wake, Paterson, N. J.

A Cup on a Decorator's Scraper

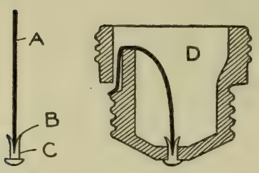
When washing or scraping walls, ceilings or other surfaces previous to redecorating, the refuse is usually allowed to fall anywhere, so that considerable cleaning and scrubbing of the floors become necessary. If the little device shown in the sketch is attached to the scraper, it will catch all the scrapings and keep the rooms tidy for the decorator. The device can be made of a piece of tin and attached to the scraper with a stove bolt.



A Tin Receptacle Bolted to a Decorator's Scraper Saves Work

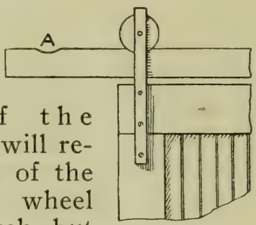
Renewing Fuse Plugs

Having a number of fuse plugs on hand which I desired to renew, I first removed the old rivet at the bottom of the plug and put in a piece of fuse wire, A, with a split rivet, C, soldered to it at B. It is only necessary to bend the fuse wire over and solder the other end as shown in D, and the plug is as good as new. A number of these fuse wires with rivets attached are kept ready, and one of them can be attached in a short time.—Contributed by W. C. Heidt, Chicago.



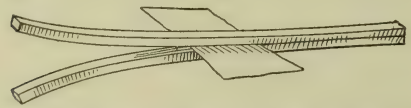
Holder for a Barn Door

A door hung on rollers is easily kept open or shut, as the case may require, by notching the track, as shown at A in the sketch, to fit the circumference of the wheel. The door will remain at the point of the notch when the wheel sinks into the notch, but it can also be easily pushed over the depression in opening or closing the door.—Contributed by Earl R. Hastings, Corinth, Vt.



Stopping a Weld

A weld can be stopped at any point by placing a piece of paper in between the pieces just before they are brought to a welding heat. The metal will not run together where the paper is placed.—Contributed by A. S. Thomas, Gordon, Ont.



A Piece of Paper Placed between the Red-Hot Parts will Stop a Weld at Welding Heat

Disinfectants for Various Articles

A deodorizer is not necessarily a disinfectant as well, nor is the reverse true. Strong-smelling substances are not usually the best disinfectants. The germicides or disinfectants best suited for some particular purposes, are given herewith.

Bedsteads—Hot carbolic acid or corrosive sublimate. The carbolic acid should be 5-per-cent, and the corrosive sublimate, a 0.001-per-cent solution.

Bedding—Steam them, boil, or use a strong formalin solution.

Brushes and Brooms—Those of a good grade may be steamed or boiled, while the cheaper ones should be washed in strong alkaline soap and soaked in carbolic acid of 5-per-cent strength.

Books—Put them in a closed place and treat with formaldehyde gas.

Dead Bodies—Wrap in sheets wet with corrosive sublimate, carbolic acid, or tricresol.

Clothing—Steaming, boiling or exposing to formalin gas is good.

Carpets—Steam them, or sprinkle formalin under them.

Draperies—These should not be allowed to remain in a sick-room. If they have been exposed to infection, they should be boiled; but if such treatment would ruin them, nothing remains to do but burn them.

Floors—All floors should be washed well with carbolic acid (5-per-cent) and corrosive sublimate (0.001-per-cent) or tricresol.

Furniture, etc.—Formaldehyde gas is good. Glassware should be boiled. Leather, skins, and other articles being partly made thereof, should be washed in a 5-per-cent carbolic-acid solution. Money, paper or coin, may be boiled, and as it is often very badly contaminated, this should not be overlooked.—Contributed by Loren Ward, Des Moines, Iowa.

¶Pulverized or floss asbestos, mixed with a little plaster of Paris and water, makes a good paste for stopping holes in stoves.

How to Build a Greenhouse

By PHILIP L. McKEE

A summer garden patch affords pleasure and profit to many people and almost everybody has either owned, or worked, or helped to work such a garden, but how many people know about the "winter garden patch." It is just as easy to grow lettuce, radishes, tomatoes, cucumbers, melons and even flowers during the winter as it is in the summer if you have a small hothouse, or greenhouse.

It is surprising what can be done with just a small greenhouse. A house, 10 ft. wide and 20 ft. long, will produce all the vegetables an average family will use during a winter season, and enough over to pay much of the expense of growing. In addition to the vegetables a great many flowers can be grown, and the greenhouse affords an excellent place for storing the house plants in the cold winter months. It will be a good place to put the geraniums, the rubber tree, the ferns and such other plants as it may be desired to keep.

The pleasure side of the greenhouse is very attractive to those who enjoy watching things grow. The work is very interesting and instructive; it brings one close to nature, and the lessons learned are from first-hand sources.

Owing to the high cost of living the profit side will probably be of most importance, and let it therefore not be overlooked that a house of the size mentioned will surely pay a dividend above the stock of vegetables for the table, if it is given just ordinary care and attention. The commercial vegetable grower, the man who grows for the market, figures a clear profit of 50 cents for every square foot of growing space in his greenhouses, and at this rate a house 10 by 20 ft. would net $75.00 above expenses. The house being small, the expenses will be greater in proportion to the quantity of vegetables produced, but on the other hand, they can be sold direct to the consumer at far better prices—probably twice as much as the truck gardener gets.

A Small House with a Floor Space of 200 Sq. Ft. will Produce All the Vegetables a Small Family can Use During the Winter Months

Anyone who is at all handy with tools can erect the house and put in the heating system. The materials can be had from the manufacturers who make a specialty of this line of work, at very reasonable prices, or they can be made by some local planing mill. Cypress is the best wood to use, but if this cannot be had, a good grade of pine or fir will do. The heating system should be either hot-water or steam, the former preferred.

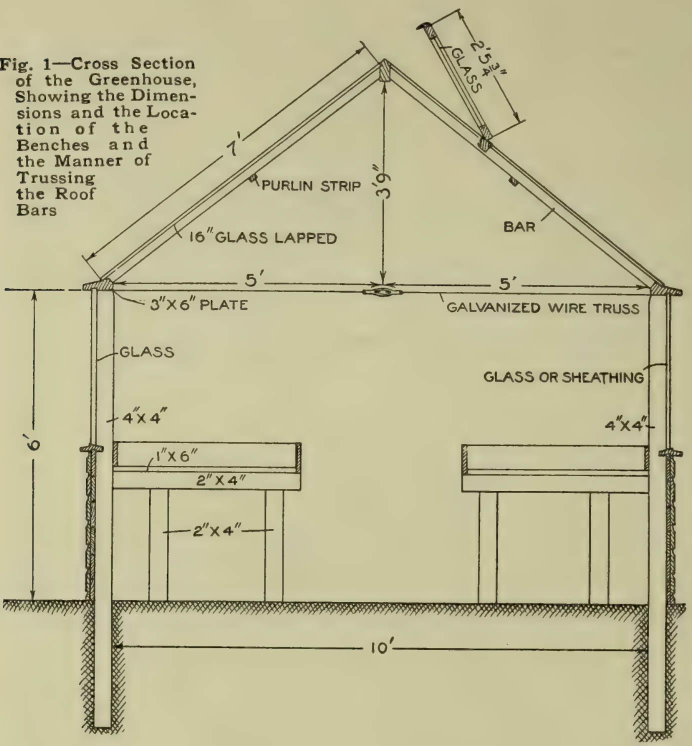


Fig. 1—Cross Section of the Greenhouse, Showing the Dimensions and the Location of the Benches and the Manner of Trussing the Roof Bars

How to Commence Work

The tools needed to complete the entire house are the following: Saw, hammer, level, square, homemade miter box, 18-in. pipe wrench, 12-in. monkey wrench, pipe cutter and a pipe threader that will thread pipe up to 2 in. in size. If all of these tools are not at hand, they can be purchased for little money new, and very cheap second hand. It may also be possible to borrow one or two for a day or so, thus saving some of this expense.

The sketch, Fig. 1, showing cross section, will give a good idea of how the house is to be framed and of its general features. By carefully studying this drawing anyone should be able to understand it without difficulty. For a house of this size the posts, Fig. 2, for the walls should be of 2-in. pipe, as this makes the best wall and gives the neatest appearance, but they can be of wood, Fig. 3, if pipe is not easily had at a reasonable cost. If wood posts are used, they should be square and planed on all sides so paint can be applied easily and to give a nice appearance. If round posts are the only ones to be had, a slab should be taken off on one side to give a nailing surface for the sheathing of the wall. The kind of posts to be used, should be decided, the posts made ready, the post holes dug, a brick or piece of stone put at the bottom of the hole and the posts set in place. These posts should be set 3 ft. deep in the soil and placed 5 ft. 2 in. apart, center to center. After the first line is set for the proper length of the house, carefully set the line for the width. If pipe posts are used, be careful when setting them to get the tops all in line and level. If the posts are wood, they can be sawn off in line after they are firmly tamped in place in the soil. A good height for the walls is 6 ft., but they may be lower or higher just as desired. Of course in setting posts, they must be arranged for pitch for the water to drain off in the gutter, unless an eave plate is used, in which case the wall should be level. Give all the material two

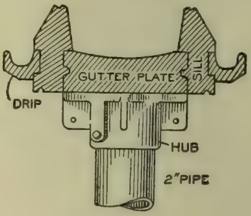


Fig.2

coats of paint before erecting the house, using white lead and oil or a good mixed paint.

Framing the Roof

After all the posts are set, they are ready for the roof framework. If the posts are of pipe, an iron flange or casting must be used on the top for fastening the eave plate or gutter in place; if wooden, simply nail the plate or gutter in position, using three 20-penny spikes at each post.

The gutter or plate may be made as shown in Fig. 3, or in any other suitable manner. After this has been done, the roof bars and the ridge should be put up. The bars should be rabbeted on each side as shown in Fig. 3, and the ridge should have a groove in each side for the glass to fit into.

Nail one bar on each side of the ridge at each end and then set in place so that the lower end of each bar rests in position on the eave plate or gutter. Nail the lower ends fast, using one 6-penny finishing nail on each side of the bar and a 4-penny on top through the tongue of the bar. Nail the intermediate bars in place, being careful to space them the proper distance apart. Mark off the places for the bars on the ridge and at the eave, or cut a small block of wood $\frac{1}{16}$ in. longer than the width of glass being used and use this as a template for spacing the bars.

When the bars are in place, fasten the hinges to the ventilator sash to be used at the top of the roof. Hinge the sash in position on the roof (Fig. 4), first nailing the little header pieces between the bars as a stop for the glass in the rows just below the ventilators.

The roof can now be glazed. Use good putty, running it along the glass rabbet on the bars with the fingers, and bedding the glass down tightly into it. Start at the lower end of the bar and work toward the ridge giving the lights of glass a lap of $\frac{3}{16}$ to ¼ in. Use one single light between the bars in the ventilators if possible, but if not, give the glass a lap the same as on the roof. Fasten the lights in place with ¾-in. No. 16 galvanized brads or brass shoe nails, and then scrape off the surplus putty from underneath the glass. Do not use putty on top of the glass as in glazing sash for a residence. A good size of glass to use is 16 by 18 in.

Gable Ends and Sides

One gable end should be glazed and the other should adjoin the residence, barn or other building in which the small heater is located that is to keep the greenhouse warm. For the glazed end use wood posts and, if desired, put in a door frame made of 2 by 4-in. studs, and a small door. Cut off the upper ends of the upright glazing bars for the end, to suit the pitch of the roof, using the miter box for this work. Glaze in the same way as the roof, but just butt the lights of glass end to end in place of giving them a lap as before.

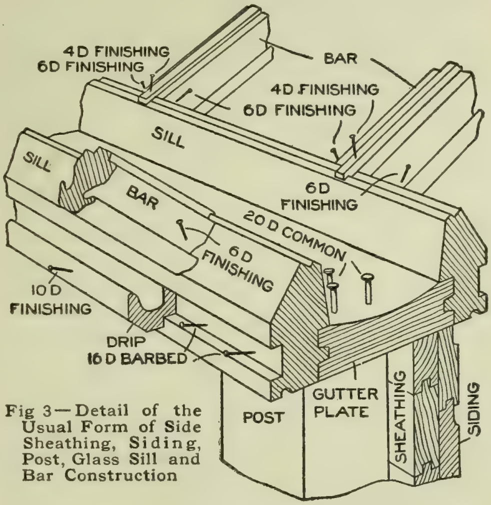


Fig 3—Detail of the Usual Form of Side Sheathing, Siding, Post, Glass Sill and Bar Construction

For the walls it will be cheaper to have sheathing from the ground to the eave, but, if desired, glass can be used in one wall to get light (Fig. 5). If the house is placed east and west, use glass in the south wall. If pipe posts are used, it will be necessary to first fasten a 2 by 2-in. piece on the outside to get a nailing surface for the sheathing. If the wall is to be boarded up solid, the post blocking will run full height, but if glass is used, it will be only long enough for the height of the sheathing.

For glass in the wall a sill is necessary for the side bars to rest on, and it should be beveled to shed the water. Nail the side bars to this sill and to the eave, just as for the roof bars and glaze in same manner as for the gable end.

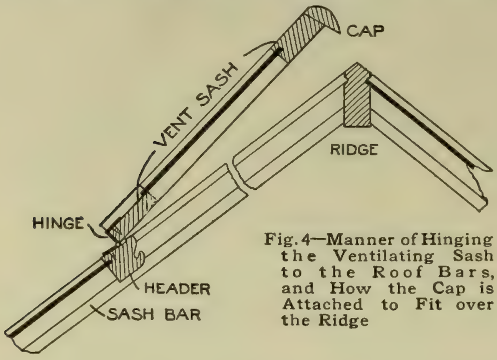


Fig. 4—Manner of Hinging the Ventilating Sash to the Roof Bars, and How the Cap is Attached to Fit over the Ridge

Nail the sheathing with 8-penny common nails. Use any common lumber for first sheathing, but have it a different width than the second, or outside sheathing, so the wall will be tight. After the first sheathing is on, use a layer of good building paper and then cover it with drop siding or clapboards. The sides and ends should be boarded alike and corners finished off by nailing the pieces upright to conceal the joint.

Benches or Tables

These can be built of common rough, pecky cypress or hemlock, using 1 by 6-in. and 2 by 4-in. material. Benches should be 36 in. high from the ground to the top. Make the legs of 2 by 4-in. material, cut 2 ft. 6 in. long, and nail them on the end of the crosspieces, cut of same material to the right length for the width of bench. The 1 by 6-in. pieces are used for the bottoms and sides. They should be placed about 1/4 in. apart for the bottom to allow for drainage. Benches should be level. Set the legs on bricks to prevent settling. For the house described use two benches, each about 3 ft. 8 in. wide.

Heating

This house, 10 by 20 ft., will require only a small amount of radiation and can be heated by a medium-sized hot-water laundry stove. This heater should be set about 3 ft. lower than the greenhouse floor, if possible. If necessary it can be placed on the same level but this will not produce a good circulation throughout the system.

From the heater run a 2-in. flow pipe into the greenhouse just beneath the ridge, or along under one of the eaves, carrying it to the far end of the house. At the far end take off two branches, one on each side, of 1½-in. pipe, leading to the return pipes under the two benches. To get an inside temperature of 60 deg., at zero outside, 9 lines of 2-in. pipe are needed for this house, or 11 lines of 1½-in. pipe. After deducting the 2-in. flow pipe there are 8 lines of 2-in. pipe to put under the benches, four on each side, or 10 lines of 1½-in. pipe, using five on each side. The lines of pipe under the benches can be made up with manifolds or tees and nipples. On the near end of the greenhouse two 1½-in. branches will again connect the coils to a 2-in. pipe for the main return. For steam use one 1¼-in. flow pipe and six lines of 1¼-in. returns, three on each side, with a 1-in. pipe for the main return.

About Buying Materials, etc.

The best plan will be to get the materials from a greenhouse manufacturer as the cost will be less and everything can be had cut and fitted ready to be set in place. He will also furnish plans and printed instructions telling how to erect everything, and thus time and money will be saved.

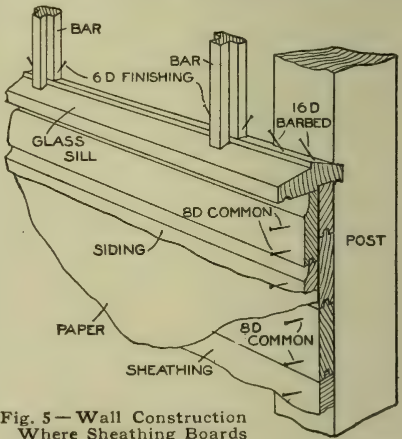


Fig. 5—Wall Construction Where Sheathing Boards are Used on the Bottom Part and Glass above the Benches

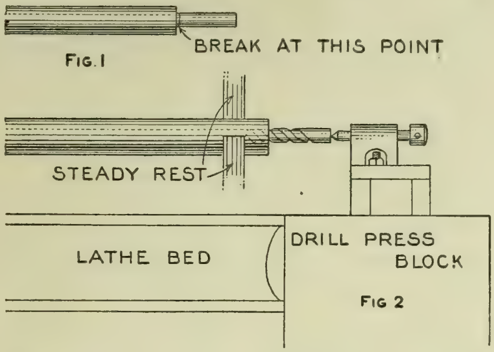
Scraper for Brass Work

When scraping brass boxes and other brass or bronze parts with the ordinary scraper, it will be observed that the tool digs in and makes rough work or chatter marks. This is due to the nature of brass which demands that, to cut smoothly, any tool, whether hand, or for use in a machine or drill, must have a straight top face or negative rake. A good brass scraper may be made from any flat or square file by simply grinding off the teeth, leaving the edges square. In use, the back edge should rest on the work as well as the straight edge, thereby lending support to the tool and helping to cut smooth.

Boring and Turning Long Pieces

I inclose a drawing illustrating how to bore and turn a piece longer than the lathe, or, at least, the way I did one long job.

There came into the shop one day a roll that had a broken journal, as shown in Fig. 1. There was a "hurry up" tag on the piece. When clinched, the roll, minus the journal, was as long as our lathe; so no help from the tailstock or carriage could be looked for. So we moved the table, or block, of the radial drill over to the end of the lathe and fastened it snugly. As it weighed 500 lb., it only needed wood clamps to keep it from pushing away. Then a planer center was mounted on parallel blocks, as in Fig. 2, and the end drilled out for a tap the size of the broken journal. After hand tapping the journal hole, a new piece was screwed in very tightly—a piece with the free end slightly larger than the required finished size. Then a compound rest from another lathe was bolted to the block, a center put in the new end, the planer center run into this, and the journal turned off to size, using the hand feed in the compound rest. This job might have been done in other ways, but the one illustrated was, under the circumstances, fairly quick and accurate and saved sending the piece to a shop having larger tools. —Contributed by D. A. Hampson, Middletown, N. Y.



The Extension on the Lathe Bed Forms a Block to Hold the Tailstock of the Lathe

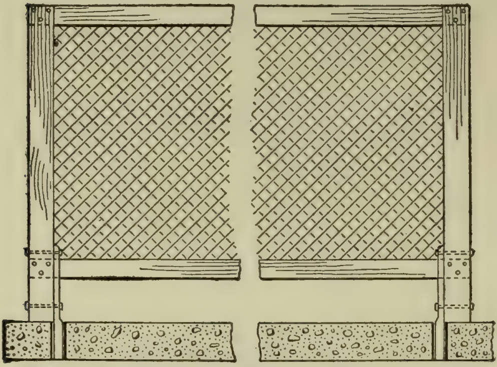
Cold-Storage Temperatures

In the following list is given a number of articles together with the approximate temperature, in degrees Fahrenheit, at which each is best kept:

Ale	33
Apples	35
Asparagus	34
Bananas	35
Beef—fresh	35
" —salt	36
" —dried	40
Beans	36
Beer	33
" bottled	45
Berries	36
Butter	20
Cantaloupes	35
Carrots	34
Celery	34
Cabbage	33
Calves	33
Canned Goods	35
Cheese	34
Cider	33
Cigars	35
Dates	50
Eggs	32
Fruits—dried	38
Fish—dried	35
" —fresh	28
Flours	40
Furs	32
" undressed	35
Game to freeze	15
" after frozen	28
Ginger Ale	37
Grapes	35
Hams—brined	36
" not "	20
Hogs	30
Honey	38
Hops	36
Lard	32
" oil	40
Lemons	36
Livers	25
Maple syrup	40
Milk	34
Nuts in shell	36
Onions	33
Oleomargarine	20
Oranges	36
Ox Tails	30
Oysters in shell	32
" in tubs	25
Poultry scalded	20
Poultry dry picked	28
Peaches	35
Pears	35
Pork—fresh	32
" —salt	36
Porter	33
Potatoes	36
Parsnips	34
Sauerkraut	35
Sausage Casings	20
Sheep	32
Sweet Corn	35
Syrup	38
Tenderloins	33
Tobacco	35
Tomatoes	35
Walnuts	35
Watermelons	34
Wines	45
Woolens	32

A Machinery Guard

The accompanying sketch shows how a guard to set around machinery may be made. It was designed by a correspondent of Power. The posts are of 1¾ by 4-in. dressed hard wood. The side strips are ¾ by 3 in. and of the same material. For a 6-ft. wheel the frame is made 6 ft. long, 4 ft. 4 in. high, and the lower side strip is set into the posts with its lower edge 8 in. above the floor. The top strip is fastened to the top of the posts as shown.



The Frames Have Metal Posts That Fit into Metal Tubes Set in the Concrete Floor

The floor irons are made of 1¼-in. pipe, cut to the desired length, and after the concrete floor has been drilled, the 1¼-in. pipe sleeves are set and cemented in place. The irons used on the frames are of 1-in. pipe, drawn out flat for about one-half their length. Holes are drilled in the flattened part for ¼ by 2½-in. carriage bolts to secure them to the frames. After the frames are made, they should be painted to match the color of the engine, and, when dry, they are covered with steel-wire fencing, 48 in. wide. When any work on the machinery is required, the frames can be removed without leaving any projections on the floor.

ℭA very effective fish bait is made by inclosing a live minnow in a short section of glass tube, which is filled with water and both ends closed with corks. Fasten this to the line in place of the spoon.

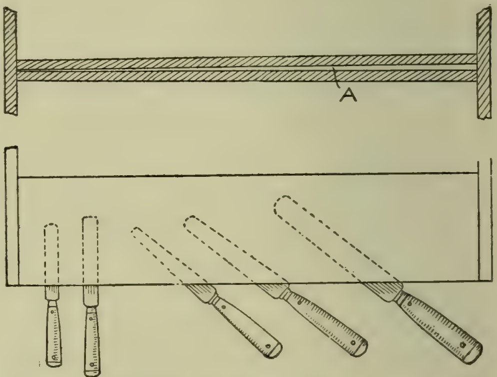
An Effective Screwdriver

When a screw cannot be turned with an ordinary screwdriver, the following method is usually successful. Put the cutting edge of a cold chisel in the slot of the screw head and slightly turn the chisel in the direction to loosen the screw. This will cause the chisel to "climb" out of the slot a trifle. Hit the head of the chisel a light, sharp blow which will cause it to bottom in the slot, but the inertia of the chisel in turning to its original position will cause the screw to turn a small amount in the desired direction. By repeating this several times the screw can be loosened so it is easily turned with a screwdriver.—Contributed by C. A. Gilson, E. Lansing, Mich.

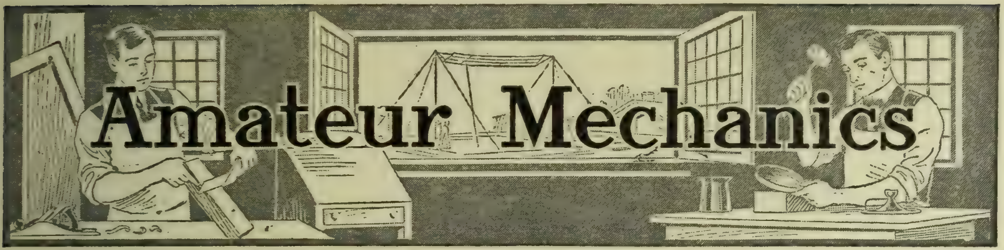
A Spatula Holder

A druggist desiring to keep his spatulas bright and clean made a place on a shelf as shown in the illustration. It is simply two shelves placed close together, with the space A between them slightly tapering from one end to the other. Before fastening the shelves in place the surfaces facing each other were covered with fine emery cloth.

After using a spatula, it is wiped clean, then run in and out the space where it fits most closely. This will keep it bright and clean, and it may then be left in the opening until needed again.



The Tapering Space between the Shelves is Lined with Fine Emery Cloth on Both Sides



To Hold a Negative in a Printing Frame

When printing postal cards and working fast, it always bothered me to hold the negative in the printing frame while removing the card. To overcome this trouble I decided to contrive some arrangement to hold the negative in the frame when the back was removed. The device I made consists of a thin, flat spring, about 1/8 in. wide and as long as the width of the frame opening. Two lugs are formed and soldered to the ends, as shown in Fig. 1, for holding the plate, and a central lug is soldered on to provide a means of fastening the spring in position. A groove, about 1/16 in. deep, was cut in the opposite end of the frame to receive one end of the negative.

In use, slide the plate into the frame and into the lugs on the spring, and push the spring upward until the plate can be slipped into the slot at the opposite end of the frame. The pressure of the spring, as shown in Fig. 2, will hold the plate securely. The frame can be handled quite roughly and as fast as desired without any danger of the plate falling out.—Contributed by Thos. L. Parker, Wibaux, Montana.

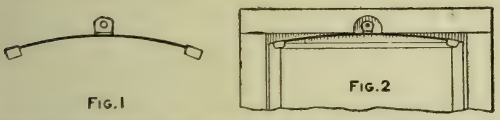


Fig. 1 Fig. 2

The Spring with Its Clips and Manner of Holding a Negative in a Printing Frame

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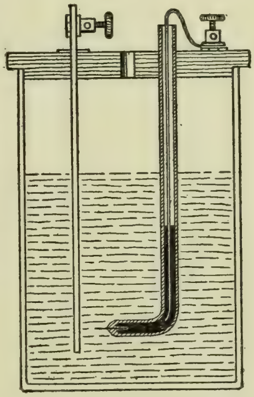
ℂA number of bright tin disks tied to the limbs of a fruit tree will prove an efficient means of driving away infesting birds.

How to Make an Electrolytic Interrupter

Obtain a glass jar or wide-mouth bottle about one-quart size. An ordinary round bottle will serve very nicely by having the top cut off, thus forming a glass jar. Make a top for the jar from a piece of 1/2-in. pine similar to the one shown in the illustration. The lower portion extends down inside the jar and serves to hold the top in place. Cut a slot in this top, 1/8 in. wide and 2 in. long. This slot should be cut at right angles to a diameter of the top and extend 1 in. on either side of the diameter. It should be about 1/2 in. from the center of the top. Directly opposite the center of the slot drill a 3/8-in hole, 1/2 in. from the center of the top. Drill a 1/4-in. hole in the center of the top to give ventilation to the jar. Boil the completed top in paraffin for a few minutes.



Obtain a piece of 1/8-in. sheet lead, 2 in. wide and about 1/2 in. longer than the depth of the jar. Mount a small binding post on one end of this piece of lead and then support it in the slot in the wooden top by means of two metal pins. The lower end of the piece of lead should be at least 1/2 in. from the bottom of the jar. Next get a piece of 3/8-in. glass tube and fuse a piece of platinum wire into one end.

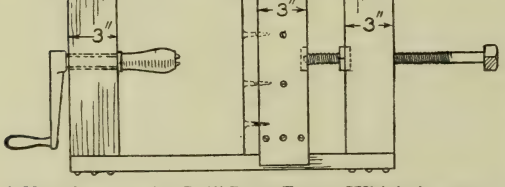
Make sure the inside end of the platinum wire is not covered with the glass, and that the outside end protrudes a short distance beyond the end of the glass tube. Now bend about ¾ in. of the end of the glass tube which has the platinum in it over at right angles to the remainder of the tube. The tube should then be placed in the opening on the wooden top provided for it and a rubber band placed around it to prevent it dropping through the opening. The lower end of the tube should be a little higher than the lower end of the sheet of lead. A small quantity of mercury should be placed in the tube and a bare copper wire run down inside. The mercury affords a connection between the piece of platinum in the end of the tube and the copper wire. Connect the outside end of the copper wire under a binding post and the interrupter is complete with the exception of the solution.

The solution for the interrupter is dilute sulphuric acid made by mixing about four parts of water and one part of acid. In preparing this mixture, be sure to pour the acid into the water, not the water into the acid. The jar should be about two-thirds filled. At least 40 volts will be required for the satisfactory operation of the interrupter. The distance between the platinum point and the lead sheet may be adjusted by simply turning the glass tube.

No condenser will be required in operating an inductor coil with an interrupter of this kind. The make-and-break interrupter, if there is one in circuit, should of course be made inoperative by screwing up the contact point against the spring.

A Homemade Hand Drill Press

The little use I had for a drill press did not make it advisable to purchase one, so I constructed a device for drilling iron and brass which answered all purposes. A broken carpenter's brace furnished the chuck, which was fastened to a ½-in. shaft having a detachable crank. The shaft turns in a brass tube which is fitted tightly in a hole bored in the upright. The sliding part or table is forced up against the drill with a ½-in. machine bolt. The bolt turns in a square nut fastened in the opposite post. The end of the screw bears on a plate fastened on the under side of the table to prevent wear. A crank could be attached to this bolt so that it may be turned more easily.



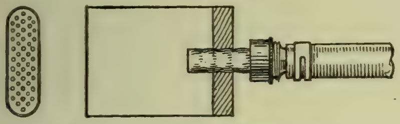
A Very Inexpensive Drill Press Frame Which Answers the Purpose Admirably

The sliding or table part is made of a post similar to the end posts, but with guides attached so as to keep it in place. The holes for the chuck shaft and bolt should be bored on a line and exactly in the center of the posts.—Contributed by L. R. Kelley, Philadelphia, Pa.

A Hose Nozzle

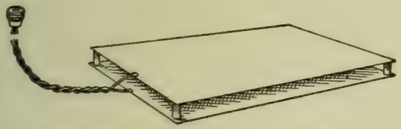
The nozzle shown in the accompanying sketch was made from an empty tobacco can having an oval shape. I cut the can in two near the center and punched small holes in the bottom. I then cut a piece of ½-in. board to fit tightly in the end of the can and turned the edges of the tin down to hold it in place. A hole was bored in the center of the wood and a ½-in. hose coupling fitted in it. The water will swell the wood enough to make an absolutely watertight joint, but by using a little care in fitting it, the joint will be watertight without the swelling.

The holes being punched in straight lines, the nozzle throws a rectangular section of fine streams, which makes it possible to sprinkle close up to walks without wetting them. The friction is much less than in the ordinary hose nozzle, and consequently this nozzle delivers more water and also materially reduces the strain on the hose.—Contributed by J. B. Downer, Seattle, Washington.


The Oval Form of the Box Makes It Possible to Sprinkle Close Up to Walks

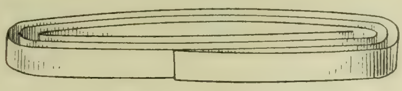
An Electric Water Heater

A simple electric water heater may be made as follows: Procure two sheets of copper, each 4 by 6 in., and place pieces of wood or other insulating material at the corners to keep them about ¾ in. apart. Bind them with cords, or, if the wood pieces are large enough, use screws so that there will be no contact between the plates. Attach wires to the plates with solder as shown, and make connections to a plug. Pour water in an earthenware jar, place the plates in it and turn the plug in a lamp socket. Do not use a metal vessel.—Contributed by G. Henry Jones, Sylacauga, Ala.


An Inexpensive Electric Water Heater Made of Two Copper Plates

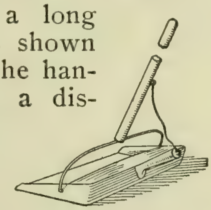
Frosting Glass

Procure a piece of flat iron similar to an iron hoop, bend it, as shown in the sketch, to make a piece 3 in. long and 1¼ in. wide and file one edge smooth. Sprinkle some fine lake sand over the glass, dampen the sand and rub the smooth edge of the iron band over the glass. It requires only a short time of rubbing to produce a beautiful frosted surface on the glass.—Contributed by M. E. Duggan, Kenosha, Wis.


The Filed Edge on the Coiled Metal Retains the Sand Particles as It is Rubbed over the Glass Surface

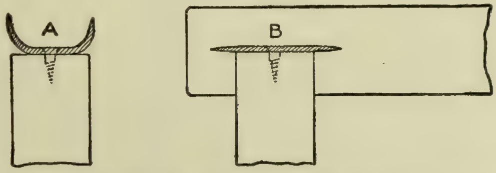
Long Handle for a Dustpan

The dustpan is a rather unhandy utensil to use, especially for stout persons. One porter overcame this difficulty by attaching a long handle to the pan as shown in the illustration. The handle was taken from a discarded broom and a yoke of heavy wire was attached to it, the ends being bent to enter holes punched in the upturned edge of the pan. A stout cord, fastened to the handle and tied into the ring of the dustpan handle, keeps the pan from turning backward, and it is thus possible to push it or carry it with the long handle.



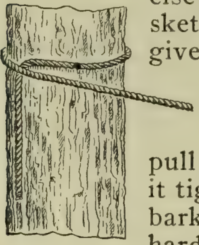
To Fasten Chair Legs

Chair legs often become loose when chairs are handled roughly, so that the glue is broken up. A small device made from a piece of pointed metal, A, which is securely fastened to the end of the chair leg by means of a screw, will hold the legs more firmly than wire or glue. When the leg is driven into the hole, the points are pushed into the wood B as the metal flattens.



The Metal on the End of the Leg Fastens It Solidly in Place

To Tie a Hammock

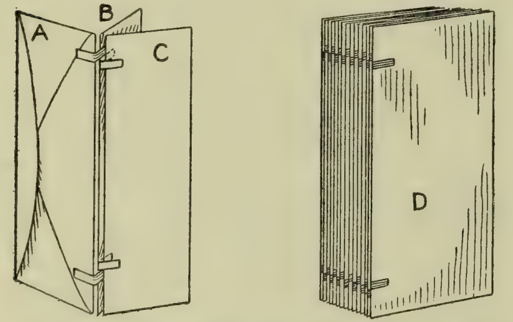


A method not generally known to quickly and securely hitch up a hammock between two trees, in camp or elsewhere, is shown in the sketch. Each end rope is given one or more turns around a tree trunk and then tucked under, as shown. The pull on the rope will draw it tightly against the rough bark on the tree. The harder the pull, the tighter the rope binds against the tree trunk. In this manner a hammock can be put up in a few moments and it is as readily taken down.—Contributed by Bert Morehouse, Des Moines, Iowa.

An Inexpensive File

Envelopes make a very inexpensive as well as a neat file for papers and letters if they are arranged and fastened together so that they can be kept in one packet. In making such a file procure as many envelopes as there will be headings in the file, also a number of strips of gummed tape, about 1½ in. long. There must be twice as many of these strips as there are envelopes.

Bind the backs of two envelopes, A and B, together leaving a space of ⅛ in. between the envelopes. Bind a third envelope, C, to B, and so on. The strips of tape from A to B and from B to C are on opposite sides of the envelope B. Continue binding until the required number of envelopes have been joined together. Assign a heading to each of the envelopes, and the file is ready for use. When completed it should appear as shown in D.—Contributed by Alfred Rice, Syracuse, N. Y.

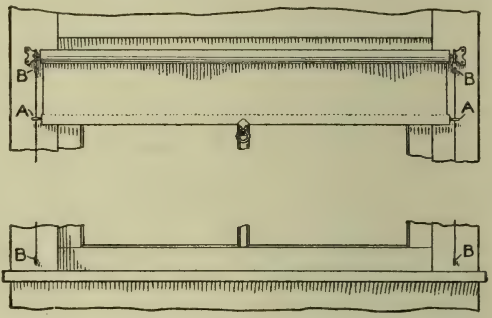


The File is Built Up of Envelopes Joined Together with Small Strips of Tape

Window-Shade Guides

The annoyance of a shade that will not run true on the roller and flops in the wind coming through an open window can be overcome by using guide wires as follows:

The stick in the hem on the lower edge of the shade is supplied with a screweye, A, at each end. A wire is run through the screweye and fastened in a vertical position on the casing with screweyes as shown by B, B. A second wire is similarly attached on the other side of the shade, taking care to have both wires parallel and true with the ends of the roller.—Contributed by George Lue, San Francisco, California.



Two Parallel Guide Wires Hold the Stick of the Shade in Its Proper Place

Watering Plants at the Roots

An effective way to water rose bushes, shrubs or plants is to place an old cowhorn in the earth so that the small end will be near the roots of the plant and the large end level with the surface of the ground, and fill the horn with water. The small end of the horn should be cut off at such a point that the hole will be about the size of a lead pencil.—Contributed by Chas. L. Richards, Philadelphia, Pa.

How to Make a Dry Cell

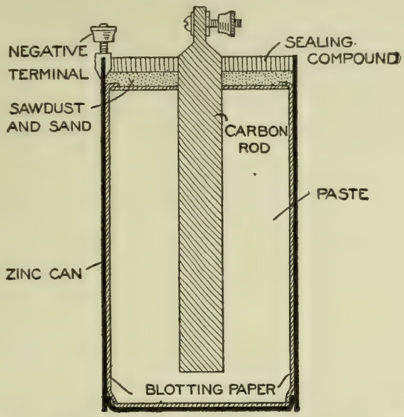
The containing vessel for the cell should be made from sheet zinc. It should be cylindrical in form, approximately 2½ in. in diameter and 6 in. long. This vessel is to form the negative terminal of the cell and a suitable connecting device, similar to the one shown in the sketch, should be provided and securely fastened to the upper edge of the vessel. The vessel should be lined with some heavy blotting paper, both sides and bottom.

Place into a glass jar a small quantity of chloride-of-zinc crystals, and pour over them ½ pt. of distilled water. Allow the crystals to dissolve at least one-half hour. If the crystals all dissolve, add more until some remain in the bottom of the jar, or until the liquid is saturated. Pour off the solution and dilute it by adding an equal part of distilled water. Add to this solution sal ammoniac, in the proportion of 1 lb. of sal ammoniac to every 2 qt. of liquid. Fill the dry-cell vessel with this solution and allow it to remain until the blotting paper is completely saturated.

Obtain a good size electric-light carbon, about ⅝ in. in diameter, and file one end down as shown. Drill a hole through the carbon and mount a terminal.

Make a mixture of equal parts of finely powdered carbon and manganese dioxide of sufficient amount to almost fill the vessel. Add to this mixture some of the solution and thoroughly mix them. Continue adding solution until a thick paste is formed.

Pour the solution out of the vessel and allow the latter to drain for a few minutes in an inverted position. Place the carbon rod in the center of the vessel and pack the paste down around it, being careful not to move the carbon rod from its central position. The vessel should be filled with the paste to within about ⅝ in. of the top. The lower end of the carbon rod should not be nearer the bottom of the vessel than ½ in. Over the top of the paste place a mixture of equal parts sand and fine sawdust and then, over this, a layer of pitch, which acts as a seal for the cell. A layer of blotting paper should be placed between the sand-sawdust mixture and the carbon-manganese mixture. The side lining of the vessel should be turned in before the sand-sawdust mixture is placed in the top of the cell. The outside of the cell should be covered with some heavy pasteboard, which will serve to insulate the negative terminal from the surface upon which the cell rests.



Cross Section through the Cell, Showing the Construction and Location of the Parts

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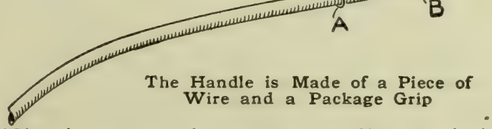
A Hose-Nozzle Handle

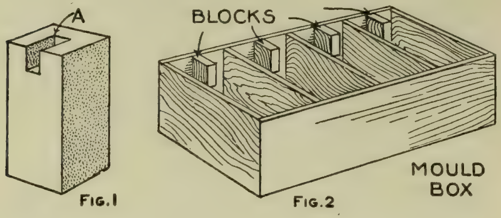
A handle for a garden-hose nozzle is easily made of a piece of wire and the wooden part of a package carrier. The wire is bent to receive the hose at A, and, after the handle is slipped on, the other end is formed to fit tightly over the brass nozzle at B. The hose nozzle can be easily carried with the handle, which will keep the hand dry.—Contributed by F. G. Marbach, Cleveland, O.



The Handle is Made of a Piece of Wire and a Package Grip

Anchor Posts for a Lawn Swing

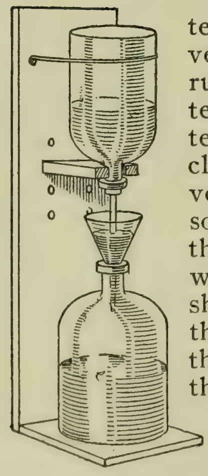
A very substantial and convenient base for a lawn swing can be made by using four anchor posts of cement, as shown in Fig. 1. The posts are made with a recess, A, to receive the legs of the swing, and of any suitable size. They may be placed with the upper face on a level with the lawn, or higher if desired.



An Anchor Post of Cement and a Mold Box for Shaping Four Posts at a Time

A rough mold box, Fig. 2, lined with paper, will do for making the posts. The box does not require any top or bottom; it is simply placed on a board and lifted away when the blocks are thoroughly dried. If the blocks are leveled when placed in the earth, the swing may be taken down and erected again without the usual leveling and bracing.—Contributed by James M. Kane, Doylestown, Pa.

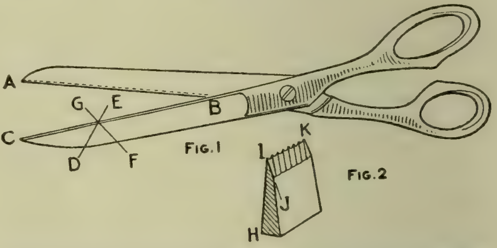
Automatic Filter



This funnel-filling filter automatically prevents the solution from running over if the filtering is slow or the filter substance becomes clogged. The upper inverted bottle holds the solution to be filtered, the cork being fitted with a glass tube as shown, and when in use the cork is forced into the neck of the bottle so that no air can enter between it and the glass. The support for holding the bottles has two brackets, one to fit the neck of the upper bottle and the other used as a shelf for the receiving bottle. In operation, the solution runs from the upper bottle into the funnel, holding the filter paper, but it cannot fill the funnel completely, because the end of the glass tube is lower than the edge of the funnel, and as soon as the liquid in the funnel covers the end of the tube, all inflow of air into the upper bottle is stopped, and, thereby, further flow of the solution into the funnel prevented, until enough has filtered through to uncover the end of the tube and thus permit air to again enter the upper bottle.—Contributed by G. Simons, Chicago.

Grinding Scissors

Whether a pair of scissors be ground or filed, the marks or scratches left from the contact with the abrasive should all extend across the bevel in the direction of the line ED, Fig. 1, and never in the direction of the line GF. If the cutting edge be examined under a magnifying glass, the tool marks or scratches left by the sharpening process will be very plainly seen, and where these scratches intersect with the face HI, Fig. 2, of the blade, they will appear as teeth along the cutting edge IK.



The Direction of the Grinding Tool should be Slightly Sloping Toward the Handles

As a pair of scissors close, the natural tendency is to thrust the material to be cut out of the angle ABC, Fig. 1, but if these small teeth formed on the cutting edge point in the direction of the line ED, this slipping action is prevented or retarded because the fibrous material adheres to the fine teeth on the cutting edge of the blades.

Wet paper, silks, mohair cloths, etc., can be sheared with perfect ease and dispatch, when scissors are sharpened in this manner. The same principle holds good for metal snips.

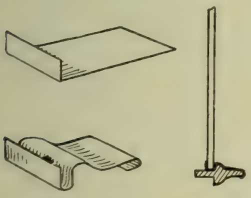
The angle HIJ, Fig. 2, varies according to the material to be cut, and the type of shear. A greater angle is required on metal shears than on shears for domestic uses.—Contributed by A. Clifton, Chicago.

To Repair a Leak in a Canoe

After striking some rocks with our canoe, it sprung three very bad leaks. These were effectively patched with pieces of cheesecloth, well soaked in liquid shellac, which were pasted on the outside of the leak. After allowing this to set for a few hours, it will be almost impossible to remove the patch. This is an inexpensive and almost invariably a sure remedy for leaks. When the cloth is dry, paint it over with the same color as the boat, and the repair can scarcely be seen.—Contributed by William B. Smith, New York City.

Holder for Loose Window Glass

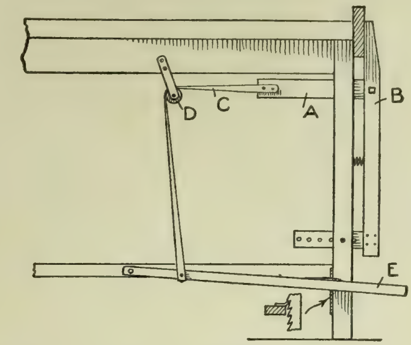
When the putty becomes loose and the glazing points work out on window glass, temporary repairs may be made by using a small piece of tin or sheet iron bent as shown in the sketch. The clip is inserted under the edge of the glass and hooked over the back of the sash parts. This will hold the glass firmly in place and also prevent rattling.



A Homemade Bench Vise

A form of a bench vise that can be easily made and attached to a workbench is shown in the illustration. This vise requires no screw, and the parts can be made from scrap material.

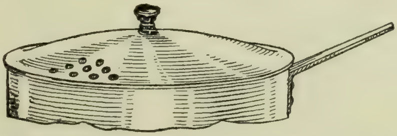
The substitute A for the screw is a rectangular piece of wood and is fastened with a tenon in a mortise cut in the vise jaw B. The clamping arrangement consists of a strap, C, attached to the piece A, then run over a pulley, D, and fastened to a foot pedal, E. The foot pedal is fulcrumed on a crosspiece of the bench and has a ratchet so as to hold it when the vise is set. The lower end of the vise is fitted with the usual form of device for parallel adjustment. A coil spring is located in the center for use in quickly opening the vise when the foot pedal is released.—Contributed by A. C. Westby, Porter, Minn.



The Vise Jaw as It is Attached to the Bench and the Substitute Screw Arrangement

A Cover Strainer

Quite frequently the cook or housewife wishes to pour the hot water or liquid from boiling vegetables or other foods without removing the solids from the kettle. This is easily accomplished, if small holes are drilled in the cover as shown in the sketch. The saucepan or kettle can be tilted and the liquid drains through the holes. Further, the steam from cooking food can readily escape through the holes, thus preventing the cover from vibrating, or the liquids from boiling over.



A Sufficient Number of Holes are Drilled in the Edge of the Cover to Make a Strainer

Picture-Frame and Triangle Clamp

A picture frame or triangle is quite difficult to hold together when fitting the corners. It is still more difficult to hold them together while the glue dries. The clamp illustrated will be found quite satisfactory in solving this problem, and at the same time is very simple to construct and easy to manipulate. The material list for making the clamps and corner blocks is as follows:

Picture frame clamp:
  4 pieces, 1¼ by 1¼ by 15 in.
  2 pieces, 1¼ by 1¼ by 5 in.
Triangle clamp;
  3 pieces, 1¼ by 1¼ by 10 in.
  1 piece, 1¼ by 1¼ by 4 in.
Corner blocks:
  4 pieces, ⅞ by 3½ by 3½ in.
  8 pieces, ⅞ by 1 by 2 in.
The pieces mentioned are of oak, S-4-S.
  1 piece ⅜-in. maple for dowels
Hardware:
  10 bolts, ¼ by 2 in.
  4 bolts, ¼ by 3 in.
  2 bolts, ⅜ by 6 in.

The picture-frame clamp consists of the four arms A, B, C and D, Fig. 1. A ¼-in. hole is bored in one end of each piece, ½ in. from the end. A series of ⅜-in. holes, 1 in. apart, are bored along the center in each piece. The two short pieces, E and F, have two ¼-in. holes bored in their centers, ½ in. from each end. These pieces are bolted to the four arms with ¼-in. bolts as shown in the sketch. A ⅜-in. hole is bored in the middle of each piece E and F for one of the 6-in. bolts K.

The four corner blocks G, H, I and J, Fig. 1, have a ⅜-in. hole bored in the center of each and a dowel glued into it with the end projecting 1¼ in. on the under side and level with the surface on the upper side. Each of the corner blocks is fitted with two pieces like X, Fig. 2. Each of these pieces has one end round or a semicircle, and in its center a ¼-in. hole is bored. The other end has a ⅜-in. hole bored ½ in. from the end.

After making the small pieces, take the four corner blocks G, H, I and J and draw a line on the upper side in the center, with the grain of the wood, and mark the angles as follows, so that one-half the angle will be on each side of the centerline: On one end of the pieces G and H mark a 90-deg. angle, on the other end a 45-deg. angle, on the piece I mark a 90-deg. and 30-deg. angle and on J mark a 90-deg. and 60-deg. angle. Mark the number of degrees of each between the sides of the angle. Place two of the pieces marked X, Fig. 2, on each of the corner blocks, one piece on each side between the different angle lines, so their round ends will be toward the center and toward each other with a space of ¼ in. between them. Clamp the pieces to the corner blocks and bore the ¼-in. holes through them to secure perfect alinement. Put the bolts in and turn the pieces first to one angle and then the other, and while in the respective positions, bore the ⅜-in. holes ⅜ in. deep in the corner blocks. Glue a dowel in each ⅜-in. hole of the small

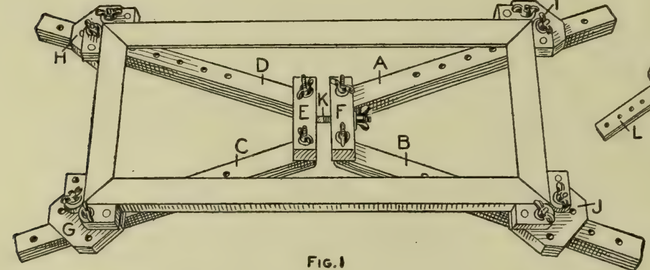


Fig. 1

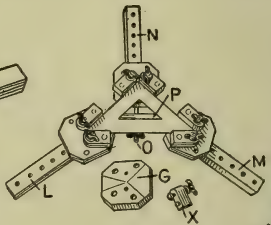


Fig 2

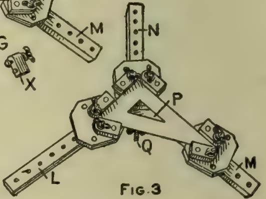


Fig. 3

The Corner Blocks on Both Picture Frame and Triangle Clamps are so Constructed That They Hold the Molding together While Fitting the Corners and also Hold Them Securely While the Glue is Hardening pieces, allowing it to project ¼ in. on the under side so it will fit in the ⅜-in. hole in the corner block. Be sure to countersink the holes for the heads of the bolts. All bolts should be fitted with wing nuts. All that is necessary to change from one angle to another is to loosen the nuts and swing the small pieces around so the dowel pins will drop into the other holes, then tighten the nuts.

The triangle clamp is made in the same manner as the picture-frame clamp, except that the arms L and M, Figs. 2 and 3, are half-lapped into the crosspiece P. The bolt O is ⅜ in. and the head is cut off. Drill a ⅛-in. hole in the bolt, ¼ in. from the end, and bore a ⅜-in. hole in the end of the arm N. Insert the headless bolt O in this hole and drive a nail through the side of the arm N, so it will pass through the hole drilled in the bolt. This keys the bolt in the end of the arm N.

To clamp a picture frame, set the corner blocks G, H, I and J to the 90-deg. angles and adjust them on the arms A, B, C and D to accommodate the size frame to be made, as shown in Fig. 1. Tighten the thumbnut on the bolt K, and this will draw all four corners together with the same pressure. The corners can then be examined to see if they fit properly. If they do not, saw in the joints with a backsaw until they do fit.

The triangles are clamped in the same way. The corner blocks are set to take the proper angles. The ends of the bolts should be slightly burred over so that the thumbnuts cannot be turned off.—Contributed by Chas. A. Pettit, Baltimore, Md.

Exterior Sliding Fly Screen

The method shown for fitting fly screens on the outside of the upper and lower sash permits the screen to be raised and held at different heights. Screweyes are turned into the outer strips, as shown in Fig. 1. The sides of the screen frame are grooved, Fig. 2, to allow it to slide up and down on the screweyes.

The screen can be raised and two of the screweyes turned from the normal vertical position, A, Fig. 3, to a horizontal position, B, to hold the frame at that point. By the use of a greater number of screweyes more places can be provided to support the screen at different heights.—Contributed by James M. Kane, Doylestown, Pa.

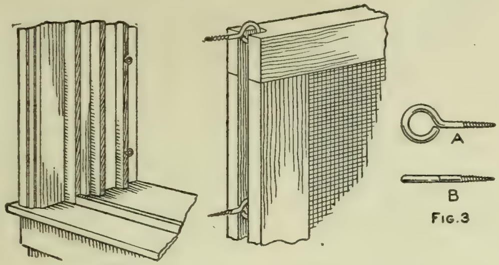


Fig. 1 Fig. 2 Fig. 3

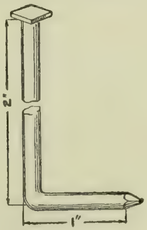
The Heads of the Screweyes in the Window-Frame Stop Slide in a Groove Cut in the Screen Frame

Bushing a Stovepipe in a Chimney Hole

When a stovepipe is too small for the hole in the chimney, a bushing can be made of the kind of metal tobacco boxes that are curved to fit in a pocket. Remove the tops and bottoms of the boxes and shove them in around the pipe. If such tobacco boxes are not at hand, tin cans of any kind can be used by melting off the tops and bottoms and bending the remaining cylindrical shells into proper shape.—Contributed by Elmer McConaughy, Dayton, O.

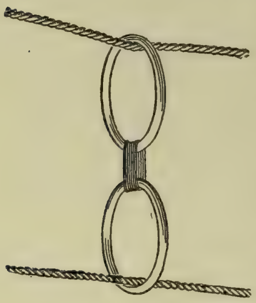
A Screweye Driver

An ordinary wire nail, 3 in. long, bent as shown and with its head filed square, makes a good tool for turning in screweyes. The square head is readily held in the chuck on most braces. The screweye can be turned in with greater speed than by the ordinary method.—Contributed by Robert T. Johnston, Buffalo, New York.



Supporter for a Double Clothesline

A double clothesline of any length should have a supporter in the center to keep the line from sagging when the clothes are hung on the lower one. The supporter shown in the sketch saves the wear from the strain on the lines. It also keeps the clothes in a higher current of air so that they dry quicker.



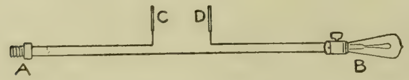
The supporter is made of two nickel-plated rings measuring 2 in. in diameter. They are bound together as shown. The rings being nickelplated, the supporter will not rust the clothes. The clothes should be arranged on the lower line so that the supporter will rest in the center.—Contributed by Katharine D. Morse, Syracuse, New York.

Pincushion for the Arm

Those that have trouble in keeping the pincushion within reach while sewing, can remedy the trouble by making one to fit the wrist or arm. An ordinary pincushion is attached to a piece of cardboard and an elastic sewed to the cardboard edges so that it will fit on the arm. The pincushion is not in the way and is readily worn so that the pins are easier to reach than if pinned to the dress.—Contributed by Frank Sterrett, Portland, O.

Electric Test for Fixtures

A very useful device for testing out fixtures before they are connected up can be easily made as follows: Two wires are run from a plug, A, one to a socket, B, and the other to terminate at C. The line from the other side of the socket B terminates at D.

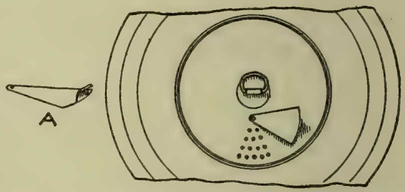


One Line of the Two Connecting Wires is Broken and the Ends Used as Terminals on the Fixture

In testing a fixture, the plug A is turned into a socket of some source of current, and a lamp is turned into the socket B. The terminal C is held to the metal covering of the fixture, while the end D is held to one of the wires. If there is a leak of current, the lamp at B and those of the fixture will light up.—Contributed by Fred Schumacher, Brooklyn, N. Y.

Opening for Steam in a Utensil Cover

When cooking certain foods the ordinary cover on a vessel confines too much steam, while if no cover at all is used, too much will escape, hence a cover which is provided with a vent is very desirable. The cover attachment shown in the illustration is evidently well adapted for service on such occasions and can be easily made as follows:



The Small Triangular Surface Provided with Holes for Releasing Surplus Steam is Covered with a Cap

Lay out a small triangle on some level part of the cover and punch several holes inside of the lines. Cut a cap, A, from a piece of tin to cover the holes. A small projection on the edge of the cap serves to swing it one way or the other, as needed, and it is fastened loosely to the cover with a soft-copper rivet, so that it may be easily opened.

Drying Seeds

A good way to dry tomato, cantaloupe, and other seeds is to put them on blotters. They will quickly dry in this manner and will not become moldy, as the blotter soaks up the moisture.—Contributed by Theodore Becker, Kansas City, Mo.

A Dissolving Coin Trick

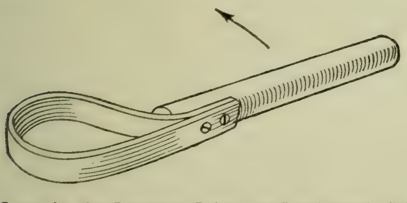
This is a very simple and effective trick. The articles required to perform the trick are, a glass of water, a silver dollar, a handkerchief and a watch crystal, or round piece of glass, the size of a silver dollar. Conceal the crystal in the palm of the hand and show the audience the dollar. Hold the handkerchief in one hand and place the hand holding the silver dollar and crystal under it so that the crystal can be grasped by the hand holding the handkerchief. Remove the dollar by holding it in the palm of the hand and slip it, unobserved, into a pocket.

Ask some one in the audience to hold the handkerchief with the inclosed crystal and ask him to let it drop into the glass of water as the handkerchief covers both. The falling glass can be heard, but upon removing the handkerchief nothing can be seen of the dollar or watch crystal. The circular glass disk cannot be seen in the water.—Contributed by Albert Biery, Spokane, Wash.

A Fruit-Jar Opener

The accompanying sketch shows a handy device for turning up and unscrewing the covers on glass fruit jars. The loop is slipped over the cover and the handle turned in the direction of the arrow. To unscrew the cover, the tool is turned over and the handle turned in the opposite direction.

The loop should be just large enough to slip over the cover easily.

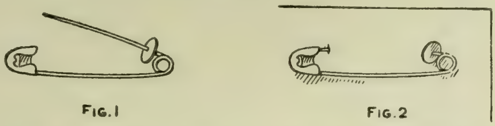


The Loop in the Leather Grips the Cap Tightly When the Handle is Turned as the Arrow Indicates

It is made of leather and fastened to the wood handle with screws.—Contributed by J. B. Downer, Seattle, Wash.

Anti-Tangle Safety Pin

A small disk of rubber or leather, placed on a safety pin as shown in Fig. 1, will prevent the fabric which is fastened by the pin from becoming tangled in the spring loop. The manner of using the pin is shown in Fig. 2.



The Small Disk on the Pin Prevents the Goods from Becoming Tangled in the Coil

How to Nickel or Silverplate Iron by Friction

The following methods of plating iron with nickel and silver appeared in a recent issue of a German paper. In nickelplating iron, a thin coating of copper is first produced on it by rubbing on a solution of 20 parts sulphate of copper, 5 parts sulphuric acid and 100 parts of water. After the copper plate has been formed rub over it, with a rag, a solution of 3 parts tin, 6 parts nickel and 1 part iron in 100 parts of hydrochloric acid and 3 parts of sulphuric acid. If finally the object is rubbed with a rag that has been dipped in finely pulverized zinc, a nickel deposit will be formed on the copper. The thickness of the deposit of nickel can be increased by repeating the two last operations.

According to a recent patent, a silver coating can be produced by dissolving freshly precipitated chloride of silver in a solution of hyposulphite of soda, 1.1 parts to 10 parts of water, and adding to this solution 180 parts spirits of sal ammoniac and then stirring in 800 parts of finely washed chalk. This mixture is applied and rubbed until it dries on the object being silvered, and the result is a brilliant deposit of pure silver.

¶A good filling for cracks in old furniture is made of shellac, either melted by heat or dissolved in alcohol to make a thick paste.

INTERESTING PATENTS,

PRACTICAL OR UNIQUE

PLATES WITH CUTLERY GROOVES (British patent)—A plate having grooves to receive knives, forks and spoons on the border or rim and to retain them there until required by the user is shown in Fig. 1. The idea is particularly designed for the self-serving type of restaurant.

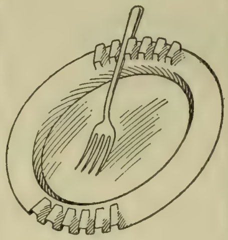


Fig. 1

RESILIENT DRIVE FOR MOTORCYCLES—In Fig. 2 is shown an interesting resilient or elastic driving arrangement for motorcycles, made possible by loosely mounting the sprocket wheel on the drive-wheel hub. Plunger rods are pivoted to the sprocket wheel, and operate in casings pivotally connected with the rim of the wheel. Springs are provided to exert tension upon the plunger rods.

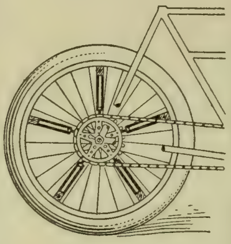


Fig. 2

SEED-CORN STRINGER—A simple stringer for seed corn is illustrated by Fig. 3. The operation of the top bar causes the crossheads at the inner ends of the lower bars to move simultaneously across each other and back, thus causing the corn-supporting strands to cross and recross over the ears of corn.

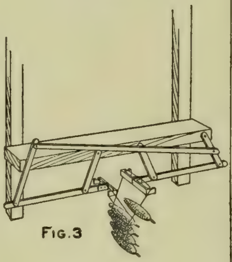


Fig. 3

MUDGUARD FOR SHOES (British patent)—A rear mudguard for shoes is shown in Fig. 4. It consists of a properly shaped piece of leather or rubberized fabric permanently attached to the shoe between the heel and the upper. It may be turned up so as to lie flat against the upper when not in use, and is provided with a clip for retaining it in this turned-up position.

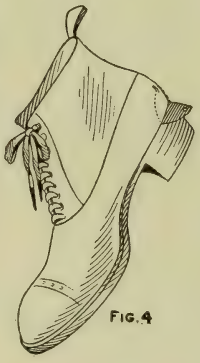


Fig. 4

SWIMMING SADDLE—Figure 5 illustrates a swimming apparatus having a form that vaguely reminds one of a Mexican saddle. It is, in fact, a water saddle in which an inexperienced swimmer may ride the waters in safety. A weighted keel keeps the device upright, with the front and rear buoys floating on the surface, and the remainder of the apparatus under water. The user straddles the saddle, with the body bent forward and the chin resting on the unsubmerged portion in front.

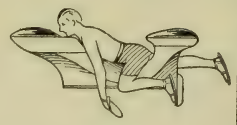


Fig. 5

REVERSIBLE GLOVE—An idea that would seem to be particularly adaptable for baseball gloves is illustrated by Fig. 6. It is a reversible glove; that is, a glove which can be worn on either the right or the left hand. This is made possible by the provision of two thumbs, each of which has an outside pocket into which it can be tucked when not in use. The glove is shown in the drawing as used for the left hand.

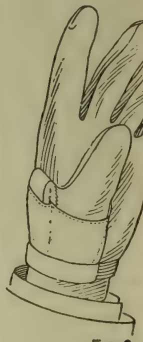


Fig. 6

SEPARATE STALL FOR BIG TOE (British patent)—The chafing of the big toe against its nearest neighbor among the little toes, often the cause of bunions or corns, has caused an English inventor to design Oxfords, slippers and sandals with a separate stall for the offending "big brother." In the case of the sandal, the big toe slips into a separate strap, but in the Oxfords and slippers a separate soft-leather compartment is provided.

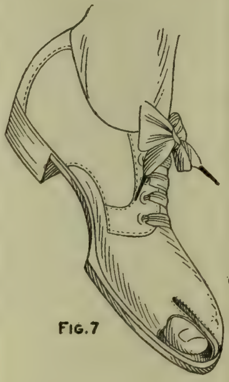


Fig. 7

CAN WITH SELF-CLOSING COVER—Lack of care in replacing the cover of the garbage can, with the result that such a can becomes a fine open-air restaurant for swarms of flies, makes the self-closing lid shown in Fig. 8, or some similar contrivance, particularly advisable for such receptacles. A pull on the handle of this self-closing cover causes it to move straight upward until free of the can-body and then swing away from the can to render the latter accessible. When the grip on the handle is released, the cover automatically swings back and descends onto the can, closing it tightly.

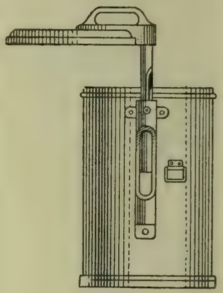


Fig. 8

POTATO DIGGER (British patent)—The rotary potato digger shown in Fig. 9 is provided with a rotary brush which sweeps the earth displaced by the soil-breaking plow point within reach of the rotating forks, which lift out the potatoes.

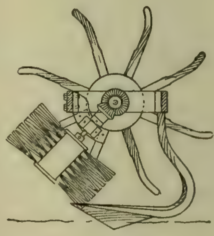


Fig. 9

NUT-GRIPPING VEHICLE WRENCH—A wrench which saves considerable time and trouble in greasing buggies is shown in Fig. 10. A spring grip takes substantial hold of the axle nut when the wrench head is engaged with it, keeping the wrench from slipping off the nut.

Fig.10

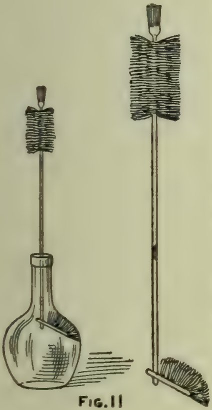


Fig.11

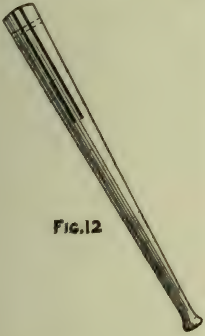


Fig.12

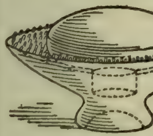


Fig.13

ADJUSTABLE CLEANING BRUSH FOR BOTTLES (French patent)—Figure 11 illustrates a new French bottle-cleaning brush with which it is possible to reach the interior of bottles of almost any shape. The lower brush is pivotally attached to the stem or handle of the upper, the stem being a hollow tube inclosing a screw. Midway of the tube is a cut-out or hole so that the user may reach the screw with thumb and forefinger in order to alter the inclination of the adjustable brush.

A BUNTING BASEBALL BAT—A baseball bat which has a feature that makes it particularly adaptable for bunting, without, it is claimed, making it in any way inferior to the ordinary bat, is shown in Fig. 12. The two slots extending lengthwise from the striking end for about a third of the total length of the bat contain nonresilient strips, such, for instance, as cardboard. When the bat is held so that the ball is struck with the cardboard strips lying edgewise to it, the force of the rebound of the ball is claimed to be substantially the same as that obtained with the ordinary bat, but when the ball is struck with the plane of the cardboard strips presented to the ball the resultant rebound is considerably deadened.

COMBINED SOAP DISH AND FLESH BRUSH (British patent)—Figure 13 shows a combined flesh brush and soap dish made of india-rubber. The studded rim of the bowl forms the brush. In the center of the bowl, under the soap, is a well into which the water drains when the device is used as a soap dish, and which may contain a washing mixture when it is used as a brush. The base of the bowl is formed with a vacuum cup to hold the device upright.

INGENIOUS TRACK LEVEL—A simple little level, which saves the section foreman from leaning over the rail to sight the level of the track, and which may be carried in the pocket, is illustrated by Fig. 14. It is claimed that with this level the section foreman can sight from 30 to 125 ft. of track by simply attaching it to the track and standing over it. In looking into the glass, he will see lines, running crosswise of the glass, which must be directly over each other and on a line with a small target placed between the two points he wants to have level. It saves the labor of stooping over so often and kneeling on damp, cold ground.

SIDE STEERING GEAR FOR AUTOMOBILES—Figure 15 is of interest because of the similarity of the steering mechanism to that of a boat. The steering wheel, attached to the outside of the driver's seat is genuinely nautical in appearance. The wheel is turned by means of the spoke handles extending from the rim of the wheel.

MAGNIFYING ATTACHMENT FOR SPECTACLES (British patent)—The combining of a magnifying glass with ordinary spectacles in such manner that the former may be readily moved into and out of the line of vision is shown in Fig. 16. The magnifying glass is mounted in a frame similar to that of the spectacles, and this frame is hinged to a block secured to the hinge bracket of the spectacles by a screw. This block, which is shown in the smaller drawing, is provided with a hole that passes over the arm of the spectacles.

LOCK FAUCET—A means of preventing waste of water through faucets located in more or less public or accessible places is shown in Fig. 17. A spring-pressed bolt normally locks the faucet plug in closed position, but the operation of the key withdraws the bolt from its hole and permits the rotation of the plug to open the faucet.

FLOATING COUCH (British patent)—This drawing (Fig. 18) shows a floating couch designed particularly for invalids undergoing a water cure, and also as a comfortable floating device for bathers. It is made in three sections, hinged together. The middle or seat portion is provided with vertical side frames inclosing air cushions, and the head portion also carries air cushions. Cords, passing over pulleys, connect the head and foot sections, so that the user can raise the head-supporting frame and lower the foot section by pressure of the feet, thus gaining an upright position.

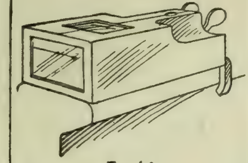


Fig.14

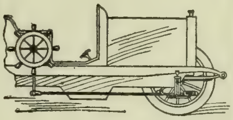


Fig.15

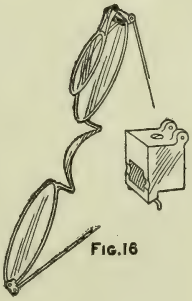


Fig.16

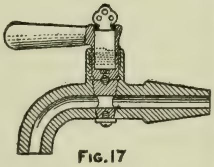


Fig.17

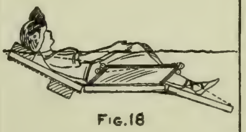
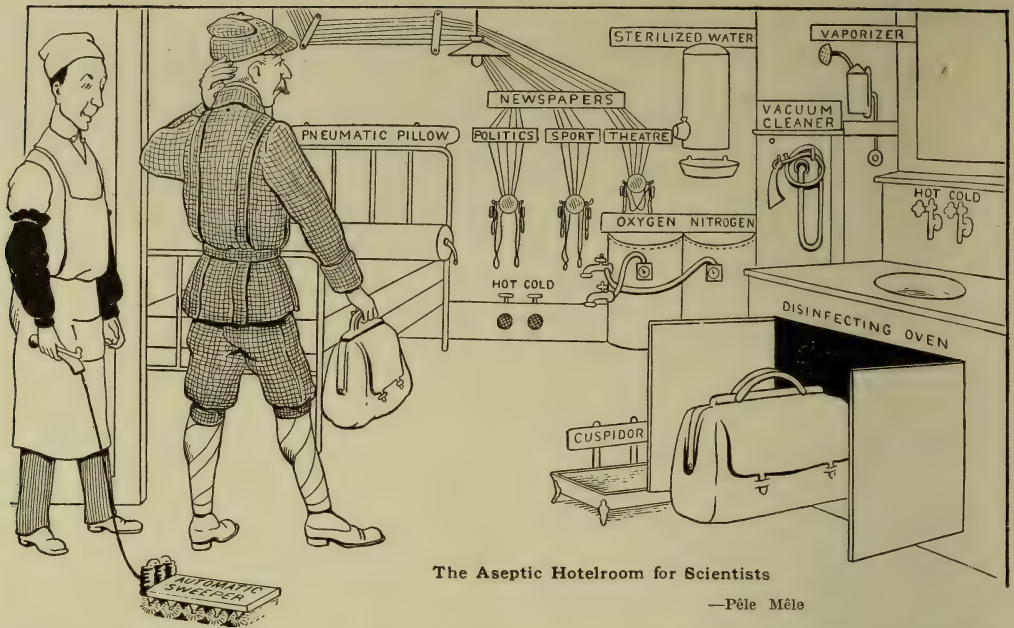


Fig.18



The Aseptic Hotelroom for Scientists

—Pêle Mêle

"I JUST saw your wife in your neighbor's auto. Why don't you take her out in yours?"

"Oh, we've just made our wills in favor of each other."—The Motor Age.

◆ ◆ ◆

Grocer—"What are you doing there?"

Clerk—"Mr. Jones has ordered a bushel of potatoes, and I'm looking him up in Bradstreet."—The Railway Age-Gazette.

◆ ◆ ◆

Small Boy—Pa, how did they first discover iron?

Pa—I have heard that they smelt it.—The Country Gentleman.

Gibbs—"I can't find 'aeroplane' in this dictionary."

Dibbs—"Have you looked on the fly leaf?"—Boston Evening Transcript.

◆ ◆ ◆

It was in the Intervale of the White Mountains. "What is the train schedule, Uncle Hi," asked a tourist of the factotum of the small summer hotel, "between here and Portland?"

"Hit's this-a-way," was the drawling answer. "Take the stage, and it hits the train. Take the train, and it hits the boat. And hit starts at quarter arter, harf arter, quarter to, and at."—Forward.

NEW BOOKS RECEIVED

HOW TO USE THE MICROSCOPE, A Guide for the novice—By Rev. Charles A. Hall, 88 pages, cloth, 5x7, 20 full-page illustrations, and 25 line drawings, indexed. Adam and Charles Black, London, The Macmillan Co., New York.

◆ ◆ ◆

MODERN ILLUMINATION THEORY AND PRACTICE—By Henry C. Horstman and Victor H. Tousley, 273 pages, 4½x6¾, flexible leather, illustrated and indexed, $2.00. Frederick J. Drake & Company, Chicago.

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ELECTRICAL INJURIES, Their Causation, Prevention and Treatment—By Charles A. Lauffer, A. M., M.D. 77 pages, 4x6¼, cloth, 50 cents net. John Wiley & Sons, New York.

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PRACTICAL AERONAUTICS—By Chas. B. Hayward. 769 pages, 6½x9½, cloth, 310 illustrations, $3.50. Published by American School of Correspondence, Chicago.

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HISTORY OF BRIDGE ENGINEERING—By Henry Grattan Tyrrell, C. E. 479 pages, 6x9, cloth, illustrated and indexed, $4.00. Published by the author, 540 Judson Ave., Evanston, Ill.

◆ ◆ ◆

FARM GAS ENGINES—By H. R. Brate. 195 pages, 5x7, cloth, illustrated and indexed, $1.00. The Gas Engine Publishing Co., Cincinnati, Ohio.

MOLDING CONCRETE FLOWER POTS, BOXES, JARDINIERES, ETC.—By A. A. Houghton, and

MOLDING CONCRETE FOUNTAINS AND LAWN ORNAMENTS—By A. A. Houghton, each 5x7, paper, 50c.; being numbers 10 and 11, respectively, of "Concrete Workers Reference Books," published by The Norman W. Henley Publishing Co., New York.

◆ ◆ ◆

RUBBER HAND STAMPS AND THE MANIPULATION OF RUBBER—By T. O'Conor Sloane, A.M., E.M., Ph.D. 167 pages, 5x6¾, cloth, illustrated and indexed, $1.00. The Norman W. Henley Publishing Co., New York.

◆ ◆ ◆

PRIMER OF SCIENTIFIC MANAGEMENT—By Frank B. Gilbreth, M.E. 108 pages, 5x7½, cloth, indexed, $1.00 net. D. van Nostrand Company, New York.

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BUILDING AND FLYING AN AEROPLANE—By Chas B. Hayward. 142 pages, 5½x8½, cloth, illustrated, $1.00. Published by American School of Correspondence, Chicago.

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DIARY OF A ROUND HOUSE FOREMAN—By F. S. Reilly. 158 pages, 4¾x6⅝, cloth, $1.50. The Norman W. Henley Publishing Co., New York.

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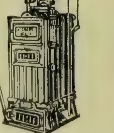
$872 Eight Rooms and Bath, very attractive Exterior; Five Closets, Airy Balcony. Size 28 ft. by 28 ft.

Design No. 53
$960 Seven Rooms, Bath, Large Living and Main Bedroom, Modern in every respect. Size 27 x 36 ft.



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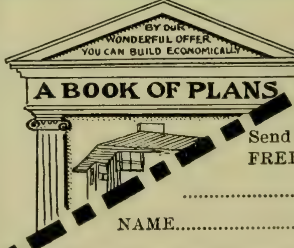
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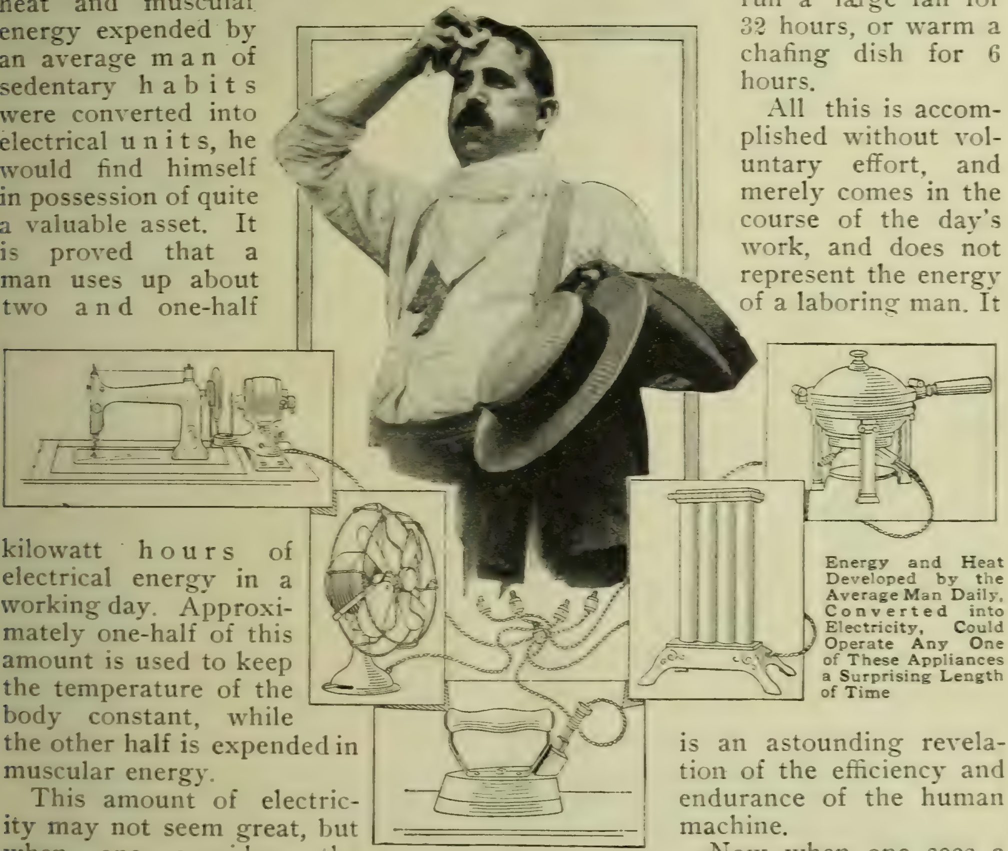
Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 18 OCTOBER, 1912 No. 4

The Human Body As An Electrical Machine

ONE does not fancy the human body as an electric dynamo, but if the heat and muscular energy expended by an average man of sedentary habits were converted into electrical units, he would find himself in possession of quite a valuable asset. It is proved that a man uses up about two and one-half kilowatt hours of electrical energy in a working day. Approximately one-half of this amount is used to keep the temperature of the body constant, while the other half is expended in muscular energy.



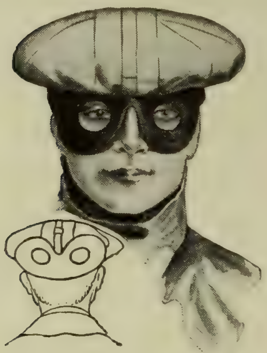
Energy and Heat Developed by the Average Man Daily, Converted into Electricity, Could Operate Any One of These Appliances a Surprising Length of Time

This amount of electricity may not seem great, but when one considers the things that can be done when it is efficiently applied, the power of the human body is more clearly seen. Two and one-half kilowatt hours of electrical energy is sufficient to maintain four 25-watt tungsten lamps of 20 candlepower each for 25 hours; or heat an electric flatiron for 6 hours; run a sewing-machine motor for 100 hours; heat an electric toaster for 4 hours; an electric heater for 2 hours; an electric curling iron for 100 hours; run a large fan for 32 hours, or warm a chafing dish for 6 hours.

All this is accomplished without voluntary effort, and merely comes in the course of the day's work, and does not represent the energy of a laboring man. It is an astounding revelation of the efficiency and endurance of the human machine.

Now when one sees a fat man toiling along on a hot day, he can realize that electrical energy is being generated and think of the many things to which it might be applied. But if the fat man were aware of his own ability as an electric dynamo, he would ardently wish that it could be used to run a large fan that would give him relief from the heat of the city pavement.

A "FORE AND AFT" CAP FOR MOTORISTS



A motorist's cap having goggles of the same material as the cap attached, the whole being so shaped that the goggled section is the back part of the cap when goggles are not desired, is shown in the accompanying drawing. That is, the cap may be worn turned completely around, the portion bearing the up-folded goggles being turned to the back when the goggles are not required.

TWELVE-PASSENGER MONOPLANE

A year or two ago when French airmen were obsessed with the desire to outdo each other in the matter of carrying live weight, several short flights were made in which as many as 12 men and boys, mostly boys, were carried. None of the machines so loaded down was designed, however, for the transportation of more than three or four passengers at the most, but a monoplane, called an "Aerobus," has now been constructed in France with a seating capacity of 12 passengers.

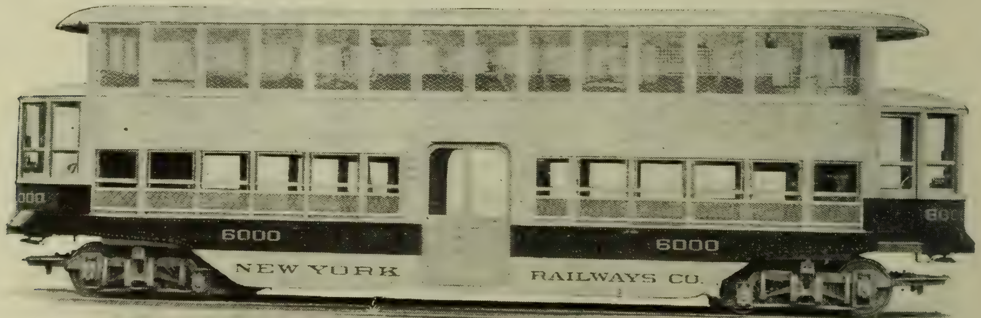
The monoplane in question has a 250-hp. motor and two propellers, a length of 52 ft., with a wing span of 45 ft., and a sustaining surface of about 860 sq. ft. The weight with passengers and equipment is approximately 2,580 lb. Seats for the passengers are arranged in two rows of six each.

NEW YORK'S DOUBLE-DECKED STEPLESS STREET CAR

The stepless street car, introduced in New York for the comfort of hobble-skirt wearers, has now been followed by a double-decked car of the same type, which has seating accommodations for 88 passengers, and a total capacity of 171. The new car, recently placed in service, will be the forerunner of many others of the same type if it proves practicable.

Economy of space makes the new double-decker only 17 in. higher than the present standard street cars. An arching roof with a central height of 7 ft. 2 in., gives plenty of head room in the lower compartment. Access to the upper deck is obtained by a central stairway. The seating accommodation on the upper deck consists of back-to-back benches which run the length of the car over the arch of the lower story.

On entering the car, the passengers face a conductor seated at a desk. The equipment of the cars includes an electrical street announcer and an automatic cash register.



One of the Double-Decked Stepless Street Cars Being Tried Out in New York

SUBMARINE LIGHT FOR POLICE BOAT

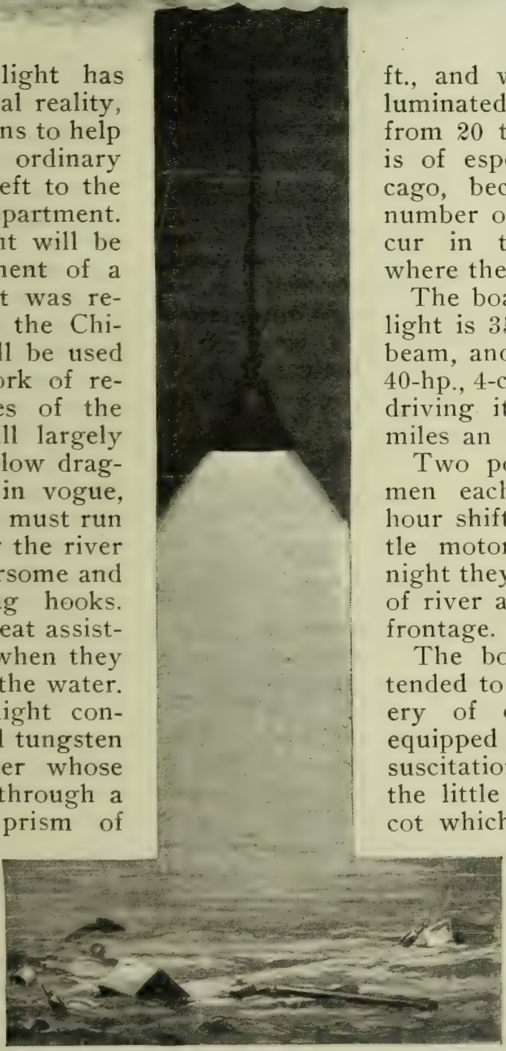
The submarine light has long been a practical reality, but its use as a means to help the police in their ordinary routine work was left to the Chicago Police Department. The submarine light will be part of the equipment of a new motorboat that was recently launched on the Chicago River, and will be used to expedite the work of recovering the bodies of the drowned. This will largely do away with the slow dragging method now in vogue, where the searchers must run back and forth over the river bottom with cumbersome and inefficient grappling hooks. It will also be of great assistance to the divers when they are working below the water.

This particular light consists of a cylindrical tungsten bulb of high power whose rays are refracted through a heavy triangular prism of glass so as to light a large area on the bottom of the stream. The light is said to be of such intensity that the river bottom may be plainly visible to depths of 18 to 20 ft., and will be partially illuminated in depths ranging from 20 to 30 ft. The light is of especial value in Chicago, because of the large number of accidents that occur in the Chicago River where the water is very dirty.

The boat which carries the light is 35 ft. long and 10 ft. beam, and is supplied with a 40-hp., 4-cyl. motor capable of driving it at a speed of 15 miles an hour.

Two police crews of four men each, working on 12-hour shifts, will man the little motor craft. Day and night they will patrol 47 miles of river and 27 miles of lake frontage.

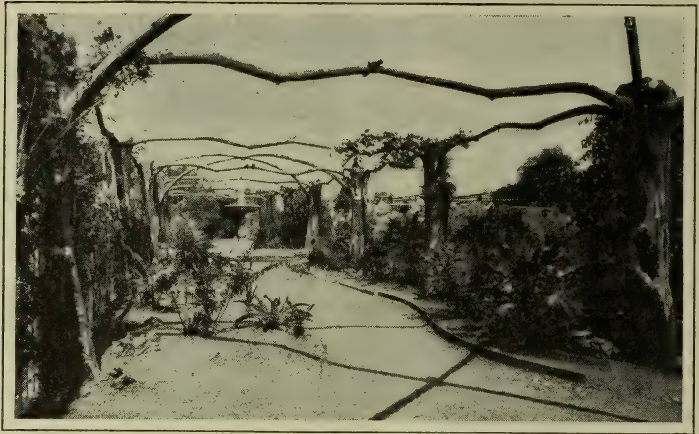
The boat is not only intended to facilitate the recovery of dead bodies—it is equipped for rescue and resuscitation work as well. In the little cabin is a hospital cot which can be drawn out from a slide in the stern. Then the seats are folded back and there is ample room to work over an exhausted person. A first-aid set is in a cabinet at one side of the cot.



Using the New Police Harbor Patrol's Submarine Searchlight to Hunt for Stolen Property or for the Bodies of People Who have been Drowned

PERGOLA FORMED OF CONCRETE TREES

Concrete was used in the garden of a home in Oakland, California, in the creation of a pergola of artificial tree trunks and branches. The imitation of scaly bark and straggling limbs of old dead trees is excellent, and a few clinging vines help to deceive the casual observer. The garden is lighted at night by electricity, the electric bulbs protruding from knots in the concrete branches.



An Artistic California Pergola Formed of Concrete Imitations of Dead Tree Trunks and Branches

FLIES AT SPEED OF THREE HUNDRED MILES AN HOUR

The frigate bird has been known to fly between widely separated points at a speed of 300 miles per hour, according to the Maritime Review. The largest of these birds, with a weight of only 8 lb., are credited with wing spans of up to 16 ft., a proportionately greater spread than has as yet been employed in any aeroplane. When this highest speed of bird flight is equalled by the aeroplane, it will require only six hours to fly across the Atlantic Ocean by the shortest courses, from Ireland to Newfoundland, or from Liberia to Brazil. It is probable, however, that such speeds are attained even by the birds only with the aid of favoring winds.

TAG POKER: A GAME FOR AUTOISTS

"Tag poker," the fundamental rules of which are the same as in the regulation card game, as far as pairs, threes, four of a kind and straights are concerned, is a new and ingenious diversion for autoists imbued with "sporting blood."

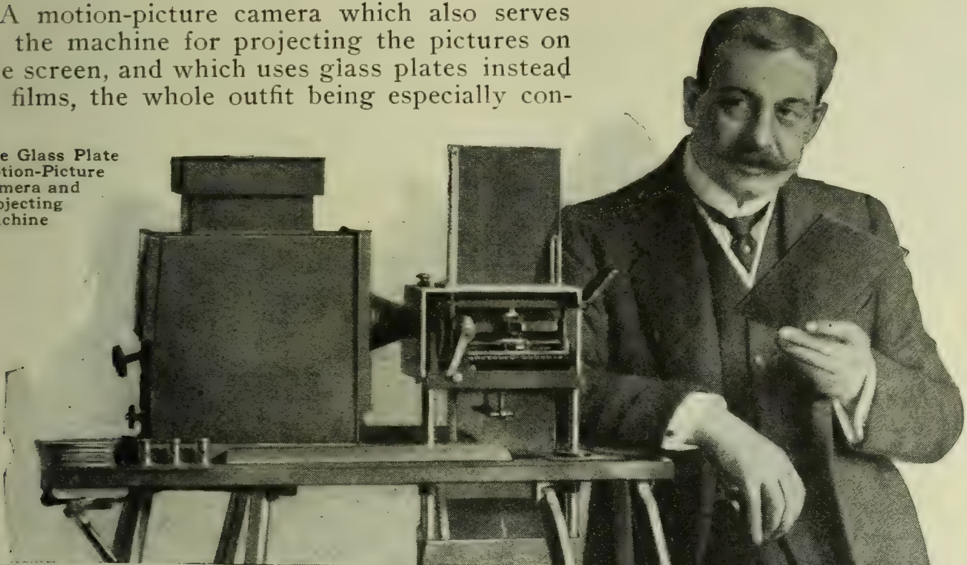
It is played as follows: The owner of the car and a friend or several friends are out for a ride, and "just riding" has grown a little monotonous. One of the party agrees to take the tag of the first car which whizzes by, and the others in the party select other passing cars until all are provided. A car passes, all in the party crane their necks to catch the number on its license tag, and the number is duly recorded. It may be, for example, 2,838. This is the first player's hand, and consists of a pair of eights. The next player selects a car before it is near enough to ascertain the number, and the number, for instance, proves to be 1,191, which gives him a hand of three ones. The player getting the highest hand, of course, takes the pot.

MINE-SOWING IN TIME OF WAR

The destructive record of mines in the Russo-Japanese war has resulted in this instrument of destruction coming into its own again. Several British cruisers have recently been converted into mine layers, and the next war will probably find "mine-sowing" upon the sea generally practiced. During recent maneuvers of the British fighters as many as seven mine-laying ships accompanied the fleet to sea. Six trawlers, converted into mine sweepers, as the vessels which search for mines are called, also accompanied the fleet.

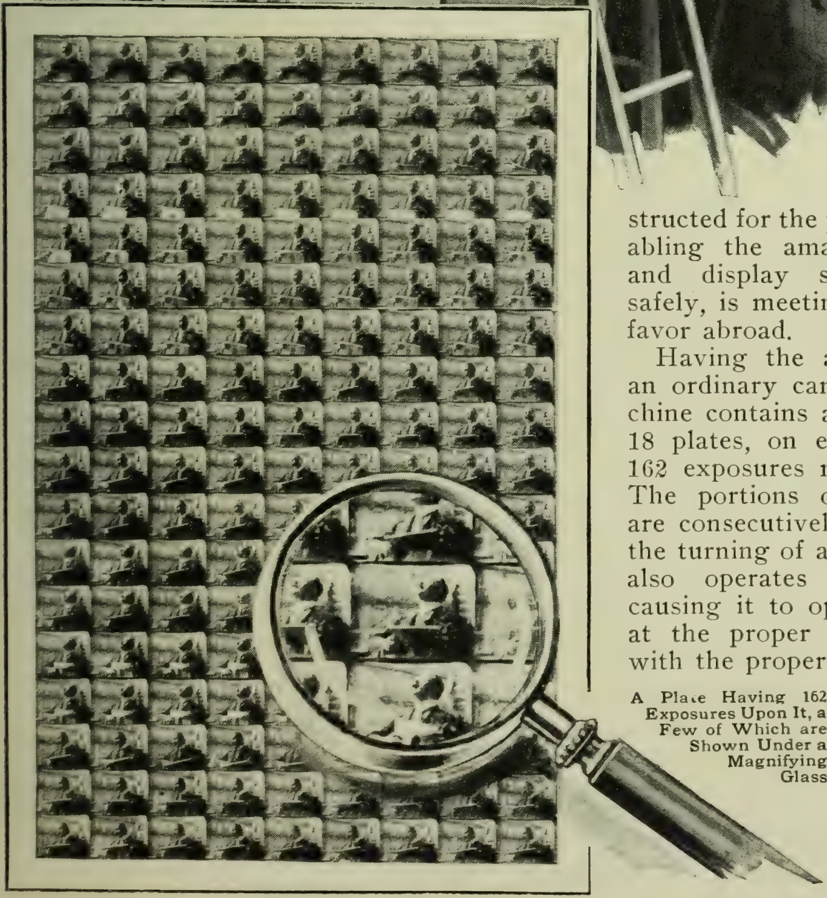
MOTION-PICTURE MACHINE USES GLASS PLATES

A motion-picture camera which also serves as the machine for projecting the pictures on the screen, and which uses glass plates instead of films, the whole outfit being especially constructed for the purpose of enabling the amateur to take and display such pictures safely, is meeting with much favor abroad.



The Glass Plate Motion-Picture Camera and Projecting Machine

Having the appearance of an ordinary camera, the machine contains a magazine of 18 plates, on each of which 162 exposures may be made. The portions of each plate are consecutively exposed by the turning of a crank, which also operates the shutter, causing it to open and close at the proper intervals and with the proper speed to produce motion pictures. The exposure of the plate begins at the upper left-hand corner and

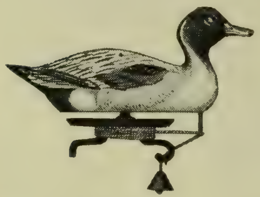


A Plate Having 162 Exposures Upon It, a Few of Which are Shown Under a Magnifying Glass continues toward the right in the top row until, as is shown in the illustration, the ninth picture is taken, then the plate automatically moves upward the necessary space, the tenth view appears immediately below the ninth, and so on, row after row. When the plate is filled with pictures it is automatically moved out of the way and a new plate substituted without the least interruption. During this operation an index on the outside of the camera informs the photographer on which plate he is working. If all the 18 plates are used, a total of 2,916 individual views will be obtained.

The developing of the plates is done in the ordinary manner, but, if containing pictures of the same series, all plates should be developed at the same time to insure uniformity.

To project the pictures, the plates are placed in the camera in their proper order, a projecting lantern is placed behind the apparatus, and the crank is turned.

COMBINED DECOY REEL AND BALANCE



A game decoy that is a combined reel and balance is the clever invention of a Chicago hunting enthusiast. A reel of galvanized iron upon which the sinker rope may be wound, acts also as the balance of the decoy. The reel is absolutely simple, with no chance for tangling the line, and also permits the sinker to be lowered to any depth without unwinding the whole cord, as is the case in the old-style decoys. This saves much time in setting out and picking up decoys, and does away with the irritation of cold fingers and chapped hands due to handling the rope in the usual type.

REMARKABLE AEROPLANE SPEED PERFORMANCE

Still the speed record of the aeroplane improves, the newest figure being 105½ miles an hour, set by Jules Védrines on July 15, at an aviation ground near Paris. The duration of the flight was 1 hr. 6 min., during which time there was covered a distance of 124¼ miles, measured around a course of six miles in length. One of the circuits was made at a speed of better than 106 miles per hour, and, because of the distance lost in keeping well away from the mark towers at the corners, it is believed that the speed would have been not less than 120 miles an hour in straight-away flying. The machine was one of the new straight-winged Deperdussin monoplanes, with a pronounced streamline body, propelled by a 140-hp. Gnome motor. The new mark was set in the elimination trials to select a Gordon-Bennett racer for the competition in Chicago this fall. Prévost, Védrines' nearest competitor, made the distance at an average speed of nearly 102 miles per hour, while Frey averaged better than 90 miles per hour.

SMALLEST ROLLER SKATES IN THE WORLD

The roller skates recently made for one of the little people appearing in a midget exhibition in England are claimed to be the smallest ever made for actual use. One of the skates is shown standing on a tea cup of the afternoon-tea size, and its smallness can be readily judged, yet they are of the latest type and designed to carry their user around the stage at a considerable speed.

THE MENACE TO THE SKYSCRAPER

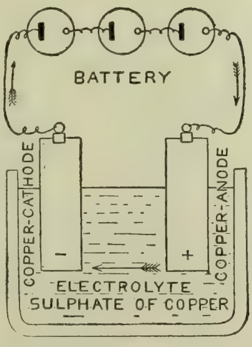
By

JOHN C. MILLER

AN enemy to the skyscraper has been brought to public notice in the last few months, that may result in some disaster, if means are not promptly taken to guard against it. It has an old name, electrolysis, and its results are the electrolytic corrosion of the water and gas pipes and all steel and iron bodies that are in contact with the damp earth, along which stray electric currents may travel seeking an easy way of return to their source, the power house.

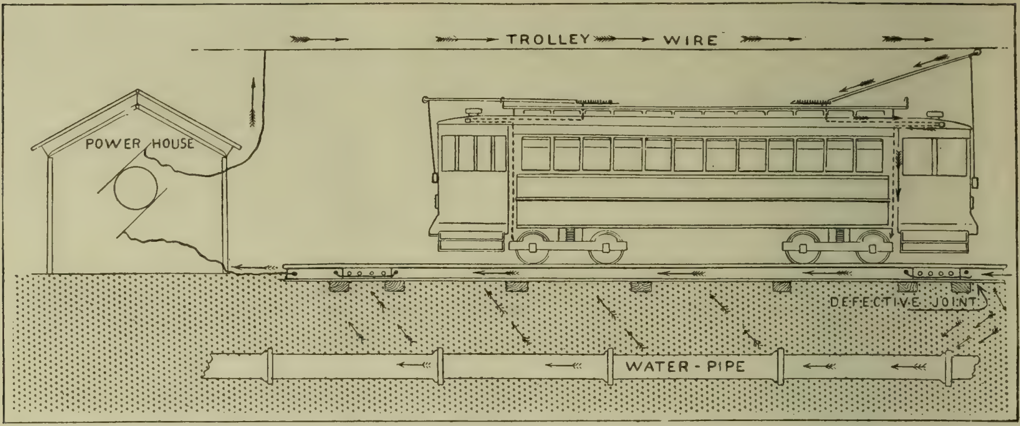
For years electrolysis has been the friend of man and until now it has been his servant. Just now it seems to be his master and has passed from his control. The brightest minds in the electrical world are grappling with the problem of protection of our steel buildings and bridges from the insidious attacks of this subtle enemy—the result of the almost universal electrification of our street railroads and power utilities.

A stray electric current having once entered the piping systems of any city will find its way to every steel structure and pipe line in that city and is farther beyond control than any epidemic that may find its source in the contaminated water supply. Both may result in loss of life and damage to property.



In This Arrangement Electrolytic Corrosion Takes Place Only When Current is Supplied from an Outside Source, the Anode Being Corroded and the Copper Taken from It Deposited on the Cathode

Electroplating has been carried on for years by that quiet transfer which takes place between two metals of different electric polarity connected by a liquid, or an electrolyte as it is called. A current of electricity will always flow from a point of higher potential to one of lower, provided a conductor connects the points, just as water will flow from a higher to a lower level through a connecting pipe. And when a current of electricity passes from one metallic body to another through an electrolyte, some of the former or positive metal is carried to the electrolyte solution and from the solution a metal is deposited on the negative or receiving metal. New metal is thus taken up by and de-

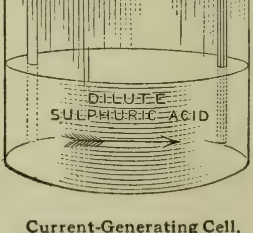


Electric Current from Power House over Trolley Wire and Pole to Motor and Rail Leaves the Latter at Defective Joint, Jumping to Water Pipe and Back to Rail Again, Thus Causing Electrolytic Corrosion of Pipes

posited from the electrolyte, and the process has been called electrolysis. The two metallic substances from which the current starts and toward which it flows are called the electrodes and must be of different potential. Potential corresponds to pressure in any hydraulic system and a difference of potential, measured in volts, produces a flow of electric current.

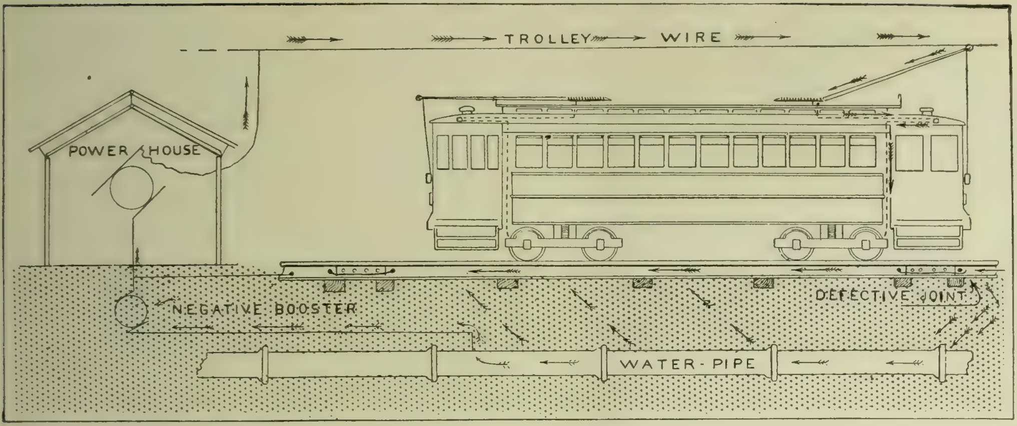
The flow is always from the positive to the negative pole in any system of conductors and electrolytes, and corrosion takes place only at the point where the current leaves the metallic body, that is, at the positive pole.

The electric current that gives rise to corrosion may be generated in several ways. It may be the result of chemical decomposition as in a battery itself, or it may be produced far away from the locality where electrolysis takes place, as is the case in cities where the source is the power house of the street railroad or power system. Here the current starts out from the positive brush of the generator, goes through the overhead trolley to the motor of the car where it does its work and returns by the rails, but if, perchance, it meets an imperfect bond or rail joint, it leaves the rails and jumps to the water pipes through the damp earth. When it leaves the pipes and jumps to the rails again, iron is carried along with it. It is to the stray currents jumping from one conductor to another of different potential that damaging electro-corrosion is due. Chemical dissociation always takes place where the current leaves the conductor and at these places the greatest damage is done.



Current-Generating Cell, in Which Electrolytic Corrosion Takes Place Spontaneously, the Zinc Becoming Corroded and Its Lost Parts Deposited on Copper Wire

The rate at which iron is carried from an electrode has been known for years, the amount depending upon the strength of the current and not upon the voltage, and is equal to slightly over a gram (about 15½ grains) for each ampere hour the current passes. Four hundred and fifty amperes will therefore carry a pound of iron from a water pipe into the damp soil surrounding it per hour. Concrete is a much better conductor than damp earth and it is not imagination to say that pounds of steel are being carried from the bases of the steel columns supporting our high office buildings to the damp earth and concrete in which these bases are buried. In a series of tests recently made in Chicago, it was shown that 251



"Negative Booster," One Remedy for Electrolytic Corrosion, But Incomplete as Saving Only That Part of the Piping behind the Connection to the Booster, Stray Currents Leaving the Pipe at Preceding Joints

amperes were flowing out of a State Street building over a 3-in. gas pipe, a 6-in. water pipe, and from the steel of the building to the tunnel rails, connection having been made between the latter by a copper cable. The maximum voltage found, as shown by the recording voltmeter, was eight volts. At the same time indications were to the effect that sometimes no less than 475 amperes flowed out of the building in one hour, or, in other words, that electrolytic corrosion would be eating away the steel which came in contact with the damp earth at the rate of over a pound per hour.

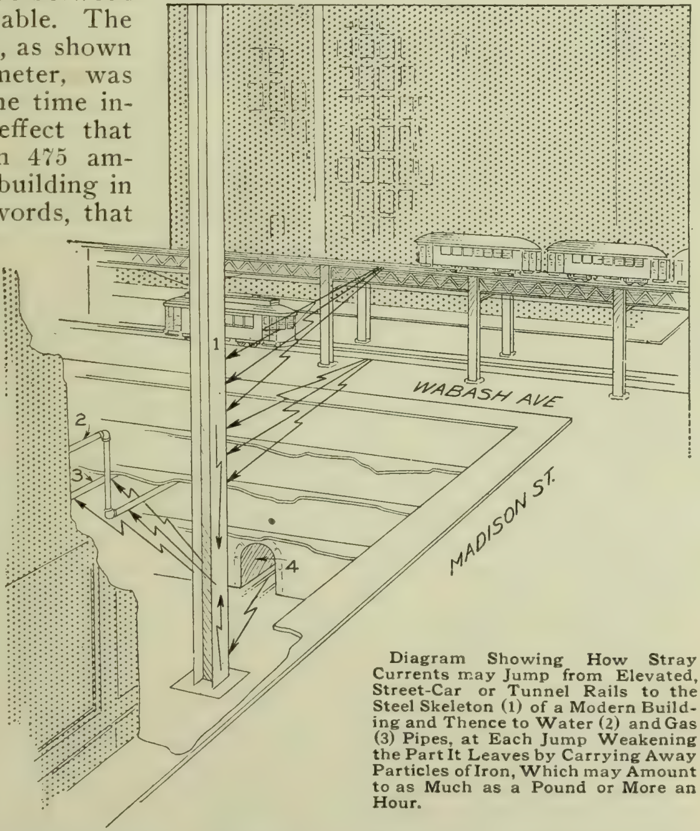


Diagram Showing How Stray Currents may Jump from Elevated, Street-Car or Tunnel Rails to the Steel Skeleton (1) of a Modern Building and Thence to Water (2) and Gas (3) Pipes, at Each Jump Weakening the Part It Leaves by Carrying Away Particles of Iron, Which may Amount to as Much as a Pound or More an Hour.

The water and gas-pipe man is well aware of the current his pipes are carrying, for sparks will occur when he severs a pipe, leaking gas will be lighted in the trench when pipes are broken, and shocks to his system by the currents he interrupts have become a common thing with him. A voltmeter will indicate a difference of potential and electrolysis surveys are being made by many of the more progressive cities. While the laws of Faraday, formulated years ago, stated the amount of iron deposited by an ampere hour, the results have often been questioned. Recently, however, extensive experiments have been carried on at

Stevens Institute of Technology, Hoboken, N. J., with various pipes buried in damp soil, and the conclusions have been reached that the amount of corrosion is at least equal to and generally greater than the amount given by Faraday (1.04 grams per ampere hour). It was also determined that the loss is independent of voltage and that less than one volt can produce corrosion. Cast iron is less liable to corrosion than wrought iron or steel. In these experiments soil of two kinds was used and the work was carefully conducted over a long period.

Four-Inch Cast-Iron Water Main, Ruined by Electrolysis, Taken Up at Richmond, Va.

Several remedies have been proposed to counteract this corrosion and all are in use in various cities with varying results. The vital point in them all is to prevent the jumping of the current from the metal to the damp soil. The most natural remedy is the overhead return for the current, which system is in operation in Washington, D. C. Here a double trolley wire is used and no current enters the rails or escapes to the earth. A great increase in cost of installation and a lack of convenience in operation goes with this remedy, and street-railway companies are naturally opposed to it while the water and gas companies favor it.

A second method is by a current-drainage system whereby a metallic connection is frequently made between underground pipes and the return rails, so that the current has a low resistance path to follow and will traverse this return cable rather than jump from the metal to the soil. In this method the steel work of a building is connected to the water pipes by a large cable and the pipes are connected to the rails so no large potential is allowed to accumulate, and no jumping takes place from the steel to the concrete footings and the damp soil.

A third remedy, and the one proposed for Chicago, is the "negative booster," in which the potential in the pipes is reduced by mechanical means. This system is in use in Glasgow, a generator being installed for every 1,000 amperes' output of the feeding stations, and cuts the difference in potential down to less than a volt, which in a great measure overcomes this corrosion. This measure is an expensive one to install and is not a complete one, making conditions worse in pipes not connected with the system.

The alarm over electrolytic corrosion is not new, but has recurred at intervals since the electric railroad came into use. Each time stronger evidences of its work have come to light and have demanded attention. The damage to water and gas pipes have compelled attention to remedies. No examples of great damage to steel structures are obtainable, but certain it is that the conditions are right for this eating away of supporting steel in contact with damp soil, for it is likewise true that great currents are traversing these columns, and common safety and prudence demand protection against this enemy of modern civilization.

LENDING DISHES AS AN ADVERTISING SCHEME

An ingenious method of advertising adopted by the gas company in Baltimore, Md., is the lending of dishes for ladies' luncheons, church affairs, and lodge and society entertainments at which refreshments are served. The emblem of the company, which is a shield bearing the words "Cook with

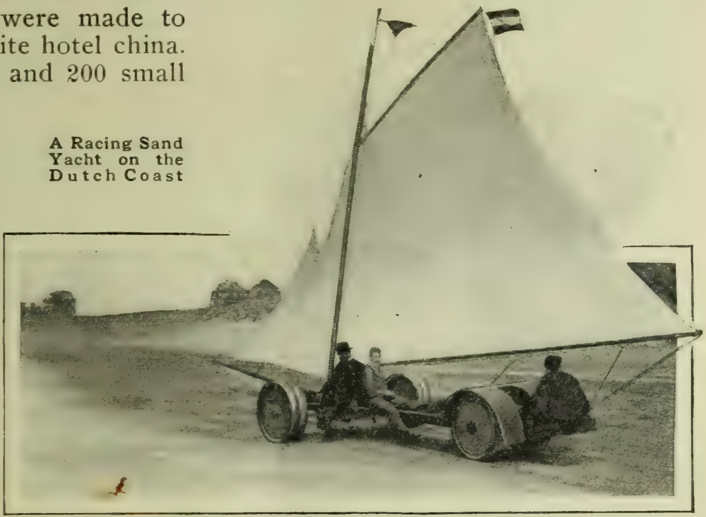
Gas," appears on each dish. Paper napkins, bearing the company's emblem are also provided.

This clever publicity idea is said by the officers of the company to be very effective, and one which is greatly appreciated by patrons. The dishes lent by the company were made to order and consist of white hotel china. They include 200 large and 200 small plates, 200 individual butters, 200 medium-sized cups, 200 saucers, 400 vegetable dishes, 60 large and 36 small bakers, 200 fruit saucers, 200 individual meat dishes, 36 large meat dishes, 60 covered sugar bowls, and 60 cream pitchers.

A set of such china can be bought at an outlay of a few hundred dollars, and the expense of a necessary supply of paper napkins is very small. Breakages, which are comparatively few, are replaced immediately, by the company.

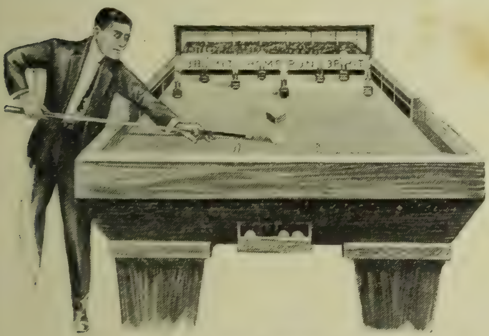
DUTCH SAND YACHT

Sand sailing is a sport more or less enthusiastically indulged in on the beach of the North Sea near Scheveningen, Holland. The four-wheeled sand craft are schooner-rigged, carrying a regulation mainsail having reefing points for shortening sail in stormy weather, and two staysails.


A Racing Sand Yacht on the Dutch Coast

BASEBALL APPLIED TO BILLIARD TABLE

A new amusement device, which adapts some baseball ideas to a specially arranged billiard table has just been placed on the market. On top of the table, in the relative positions ordinarily occupied by baseball players on a regular diamond, there are miniature figures of players over a series of pockets. The face and sides of these pockets are cushioned and are so designed that the balls enter the pockets quickly and quietly. On either side of the table and in the rear, there are pockets indicating "singles," "triples," "home runs," and "fouls." The batter's box is near the front of the table where an average-size billiard ball is placed and then caromed off a triangular rubber home plate which is mounted on a spindle. This plate revolves when hit by the ball, giving the player a constantly changing shot which makes the game very scientific.


Playing the New Baseball Game on a Billiard Table

A BARN BUILT OF WORLD'S FAIR WRECKAGE

On Cottage Grove Avenue, just beyond the southern city limit of Chicago, is a barn which owes its curious appearance to the fact that many odds and ends of the Chicago World's Fair buildings contribute to its make-up. The windows belonged to one of the German buildings. The top of the structure is used as a pigeon roost.

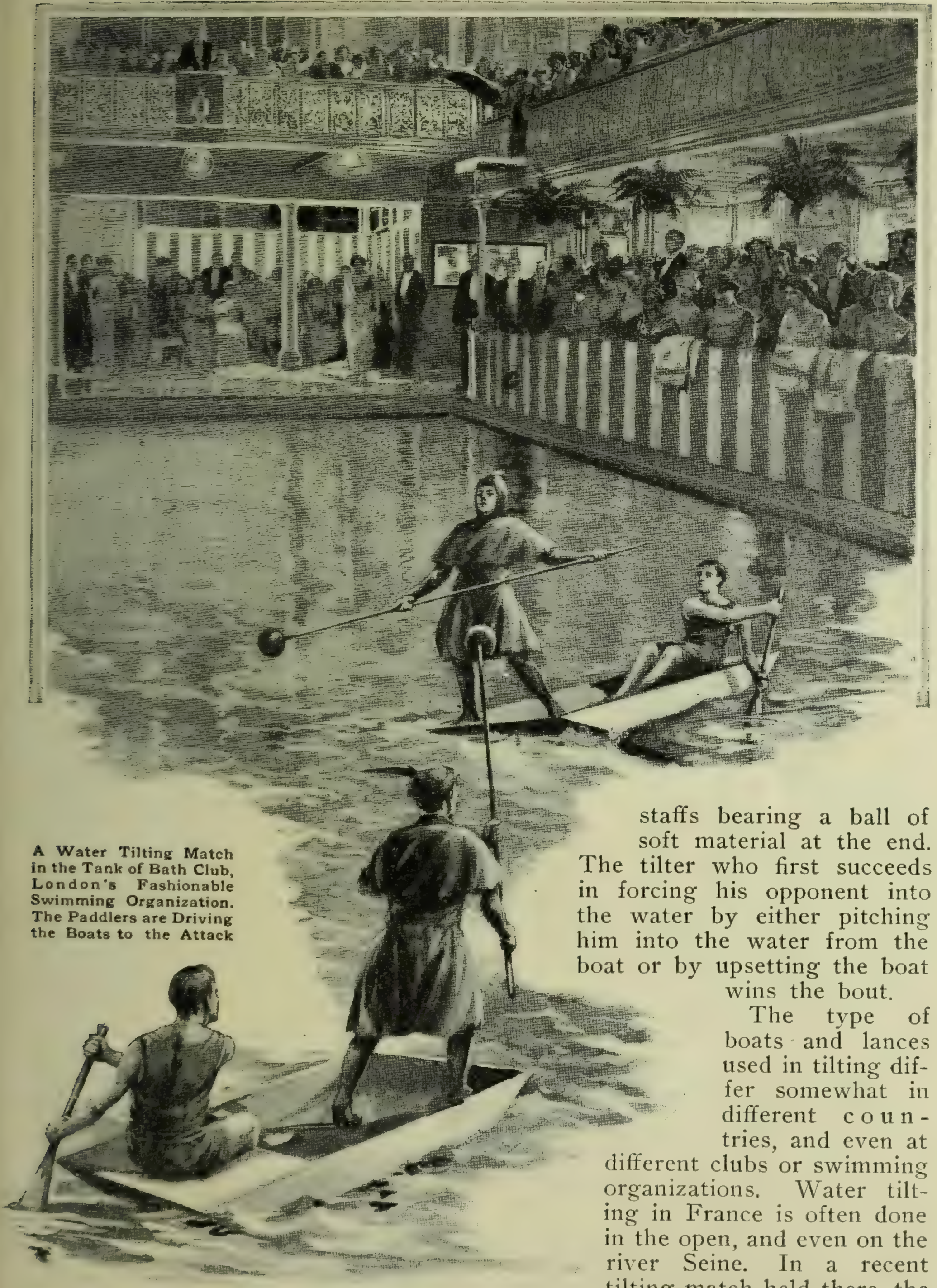
A Barn Built of Odds and Ends of the World's Fair Buildings

ARTICLES GLOW IN ULTRAVIOLET RAYS

Interesting experiments with the ultraviolet rays recently were made by a German physicist which he relates in a report made to a society of physical experimenters. In conducting the experiments he made use of an improved "filter," evolved by himself,—a device which excludes almost entirely the visible rays of the spectrum. Among the noteworthy effects produced was the glow or fluorescence exhibited by certain substances used by the experimenter. The majority of substances, in fact, shine when acted upon by the ultraviolet rays. Porcelain and metals, when free from oxides, are among these. The human body, also, is fluorescent under the influence of the light. Bluish-white light is radiated from a paper or linen screen when either is placed in the cone of ultraviolet rays in a dark room. This is defined not as the "color" of the ultraviolet rays, but as a secondary light, which is proved by the fact that if a sheet of white porcelain is placed before the screens, the porcelain does not shine similarly, but bears resemblance to black velvet. The surface of a hard boiled egg, cut in two and exposed to the rays, shows varied colors. The shell shines reddish-white, the "skin" bluish-white, the albumen citron-yellow and the yolk dark yellow. The muscle tissues of a veal cutlet appear brownish-red, the gristle an intense blue-violet, the bones whitish-blue, the fat yellow and the sinews and skin white. Very marked fluorescence is exhibited by the human body. Frequently the hands appear whitish-blue, dark hair shows gray, and the lens and cornea of the eye and the natural teeth a bright whitish-blue. The unnatural white of false teeth becomes black. Rouge or other preparations on the skin are betrayed by the rays. Artificial gems may be distinguished from the genuine by aid of the mystic light. Differing types of glass have various forms of fluorescence. The entire mass of paraffin wax is disclosed in intense blue. Practical use of the luminescent analysis, it is believed, will be found in mineralogical and botanical research work.

TILTING CONTESTS ON THE WATER

Water tilting is a sport enjoyed in many countries, our own included, and is usually one of the most interesting of the minor features of water carnivals. The illustration shows a tilting contest in the swimming tank of the Bath Club, which is the fashionable swimming club of London. The boats used for tilting are flat-bottomed punts, each of which carries a paddler as well as a "water knight." The tilters are dressed in a costume reminis-



A Water Tilting Match in the Tank of Bath Club, London's Fashionable Swimming Organization. The Paddlers are Driving the Boats to the Attack

cent of "ye olden times," while the paddlers are in ordinary bathing suits. The tilting lances are long limber staffs bearing a ball of soft material at the end. The tilter who first succeeds in forcing his opponent into the water by either pitching him into the water from the boat or by upsetting the boat wins the bout.

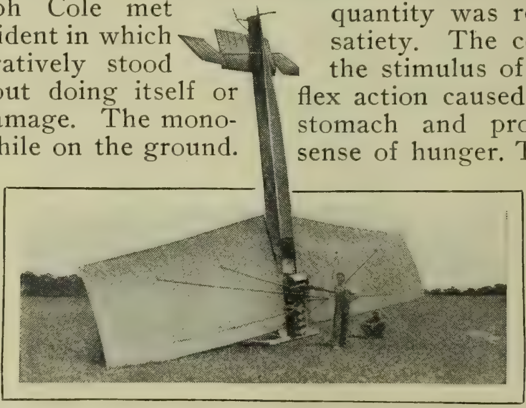
The type of boats and lances used in tilting differ somewhat in different countries, and even at different clubs or swimming organizations. Water tilting in France is often done in the open, and even on the river Seine. In a recent tilting match held there, the wielders of the tilting lances stood on platforms erected on the bows of long rowing barges, which were driven toward each other by as many as six rowers to a boat. The tilters carried shields with which to protect themselves from the lances, and ward off the blows. Water tilting in America is usually done with light canoes, one man paddling the canoe and the other standing as best he can in such an insecure craft. Quite often both canoes upset at the impact of the lances.

ELECTRICAL HEATING PAD FOR EAR AFFECTIONS

Inflammatory affections of the inner ear are accompanied by intense pains, which cannot easily be relieved except by continuous application of heat. Hot-water compresses are not very efficient, because of the necessity of changing, but by means of the electrically heated pad, a recent German invention, constant or graduated heat can be applied continuously for any length of time. The heating element is inclosed in the ear pad, and in order to vary the heat, two lamps are connected into the circuit, which by a special switch can be arranged either in parallel or in series, and one or both entirely excluded.

MONOPLANE STANDS ON ITS HEAD

While making a flight at Norwalk, Ohio, with a monoplane of his own construction, Ralph Cole met with a peculiar accident in which the machine figuratively stood on its head without doing itself or its operator any damage. The monoplane tipped up while on the ground.



A Monoplane That Tipped Up on End without Damage

¶Ledgers discovered at Palos, Spain, indicate that the voyage of Columbus which resulted in the discovery of America cost $7,500.

¶The moving-picture machine has invaded the sacred precincts of the Vatican in Rome, the Pope having been recently entertained with a moving-picture show.

TIGHTENING ONE'S BELT TO REDUCE HUNGER

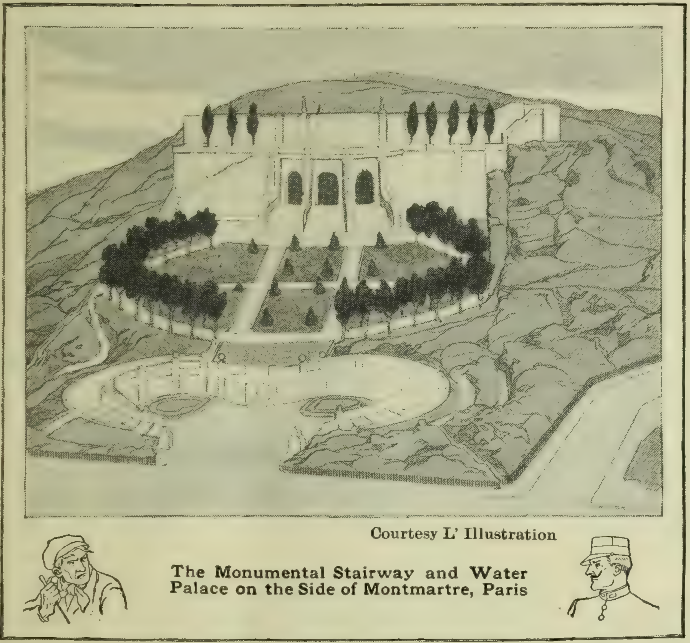
Investigations recently completed by Prof. Rudolf Lennhoff, to ascertain in what manner constriction about the body in the region of the stomach lessens hunger, have, according to reports published in German papers, led to the interesting result that the plan sometimes followed by hungry tramps and others, of tightening the belt is the correct and scientific manner of accomplishing the desired result.

Metallic substances were mixed with solid food, such as potatoes, and fed to men. The X-ray revealed that a contraction of the stomach took place and a relatively small quantity of the food proved sufficient to satisfy the appetite. When liquid food was given, the contraction was considerably less and a larger quantity was necessary for satiation. Another experiment, in which the liquid food was introduced through a tube, showed that twice the quantity was required to produce satiety. The conclusion was that the stimulus of swallowing by reflex action caused contraction of the stomach and produced a lessened sense of hunger. This suggested that artificial pressure over the stomach by means of a belt, a common expedient of the tramp, might produce the effect, and this proved to be the case. In order to eliminate the effect of suggestion, the experiment was tried on insane persons who were allowed to eat as much as they pleased. During the experiment they ate less, satiation occurring sooner.

A MONUMENTAL STAIRWAY UP MONTMARTRE

The last vestige of the old Montmartre district of Paris, which has been inhabited from times immemorial by the Apaches and rougher element of Paris, and, lately, also by art students and followers of art who tired of the old "Quartier Latin" or were driven out of it by extensive municipal changes, will soon have disappeared. The final link in the scheme for the beautification of the heights which bear the name "Montmartre," is the construction of a monumental stairway up its side from the public square which flanks its south declivity.

The stairway will lead to a "Chateau-d'Eau" (water palace), below which will be a circular garden planted with trees. The water palace will contain three fountains and have a roof garden on its top.



Courtesy L' Illustration

The Monumental Stairway and Water Palace on the Side of Montmartre, Paris

The cost of the improvement is estimated at $500,000. Exceptional difficulties have to be met in the construction of the foundations, due to the lack of solidity of the soil in this portion of the hill.

TERRIER ADOPTS A BROOD OF CHICKS

An odd example of maternal affection displayed by a dog toward a brood of incubator chicks comes from Long Beach, Cal. The fox terrier takes care of the brood like a motherly old hen, trying to keep them warm with her body and being most solicitous that they do not stray away. Any attempt to handle her adopted family, is resented by the dog, and when a chick succeeds in straying away she lifts it tenderly in her mouth and brings it back to the box.

A Fox Terrier Contentedly Allowing Her Adopted Brood of Chicks to Cuddle under Her Body or Perch Upon It

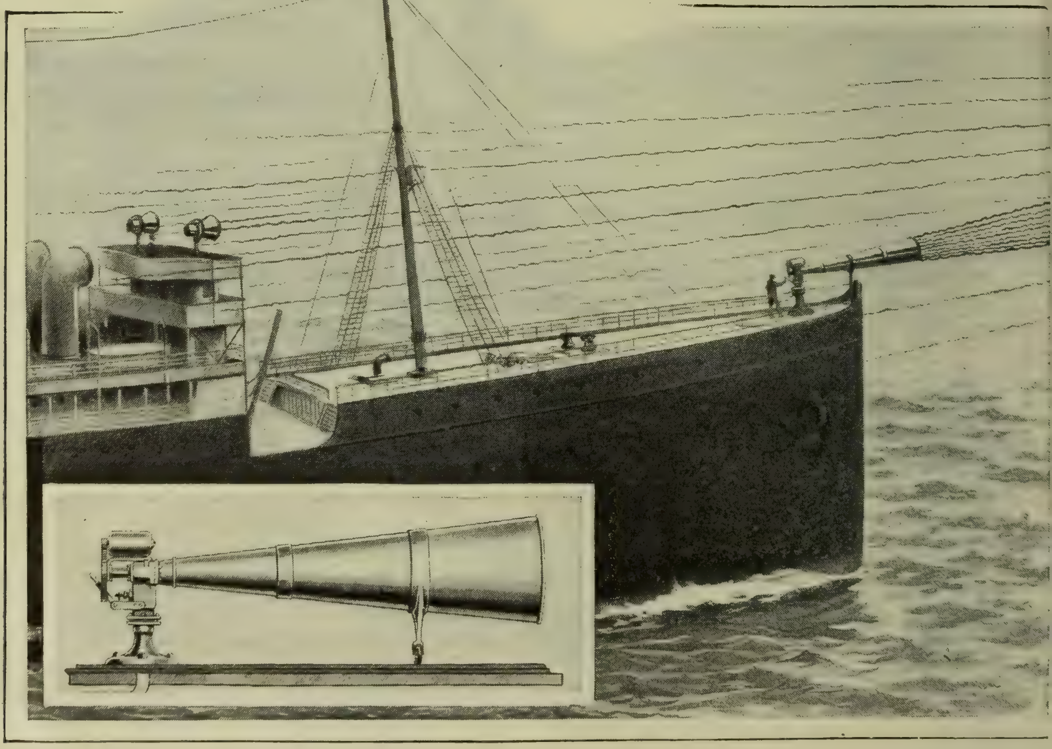
¶The Royal Society of London, or "The Royal Society for the Improvement of Natural Knowledge," as it was called in its charter from King Charles II, celebrated the 250th anniversary of its organization in London, July 15.

OCEAN SHIPS TO HEAR THE PRESENCE OF ICEBERGS

Taking his lesson from the bat, which has the faculty of avoiding obstacles in a degree of darkness that renders eyes useless, Sir Hiram Maxim proposes to equip ships with a mechanical apparatus which will perform a function of like nature.

"When a bat flies about in total darkness, the beat of its wings," says Maxim, "sends out a series of pulsations or waves. These waves strike against all surrounding objects, and are reflected back and received by the sensitive organs which form a part of the bat's face. The extremely delicate nature of the wings, together with the sensitiveness of these organs of a 'sixth sense,' enable it to judge the distance to any object by the lapse of time between the sending and the receiving of these very faint waves."

The apparatus Maxim has devised to provide ships with this same sixth sense, mechanically, comprises a device for producing and sending out the necessary air waves; another, for receiving back the reflected waves and making them reveal their presence by ringing bells, and a third, for recording the amplitude of the waves. The first consists of a modified form of siren, using high-pressure steam, and producing powerful air waves having a frequency of 14 or 15 vibrations a second. Waves of such low frequency cannot be heard by the human ear, but, being of great amplitude and power, they will be able to travel great distances, and on striking any object will be reflected back in the same way as sound waves, though the echo will be as inaudible as the primary vibrations. The siren would be provided with a trumpet mouthpiece and be so mounted that it could turn in any direction.



The receiver, which may be considered as an artificial ear, consists of a diaphragm of rubber and silk, about 4 ft. in diameter, stretched tightly over a drum-shaped cylinder, and so arranged that the air pressure would always be the same on both sides of it, irrespective of the blasts from the siren. The vibrations set up in this diaphragm by the reflected waves are caused to close a series of electrical circuits, each containing an electric bell of different pitch. Feeble waves, such as would be reflected from a large object at a considerable distance, or small objects near at hand, would cause only slight vibrations of the diaphragm, and thus would close only the first electric contact, thereby ringing the first or smallest bell. Larger and nearer obstructions would close a second contact and ring a larger bell, and so on, thus giving warning of danger.

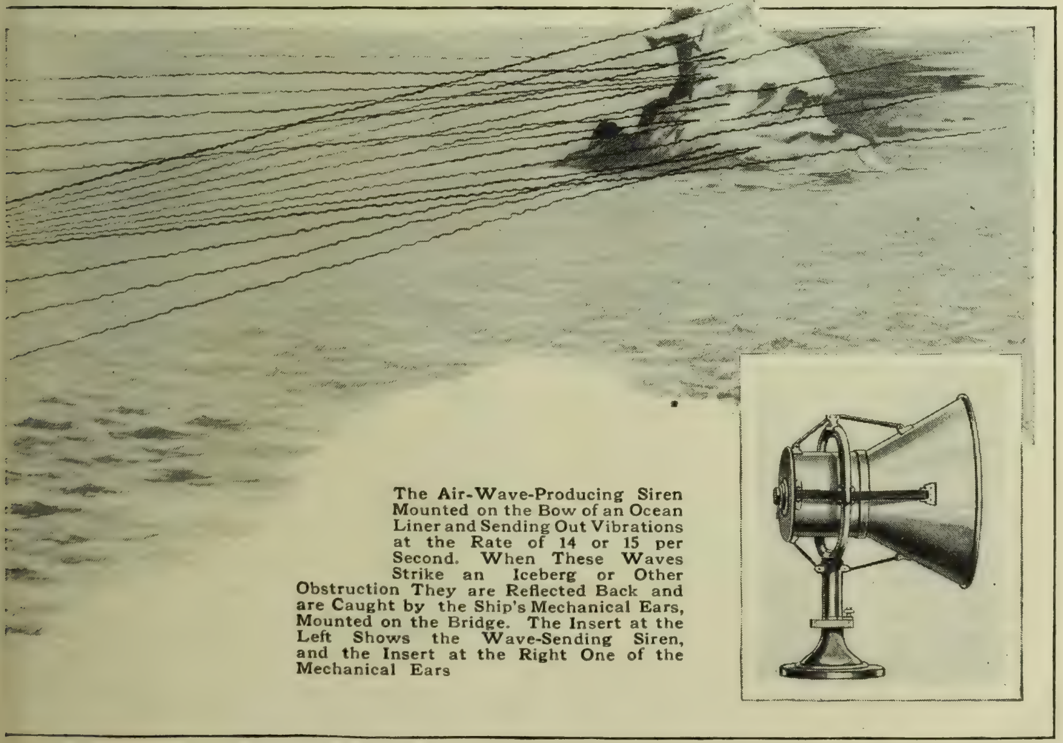
The recorder, forming the third part of the apparatus, is simply an arrangement to give a written diagram of the disturbances of the air.

UNUSUAL COMBINATION OF TRACTION METHODS

The harbor board of Altona, Germany, recently solved a difficult transportation problem by combining old and new traction powers in an ingenious way.

Merchandise discharged at the port had to be transported over two roads of rather steep grade. The only available wagons were horse-drawn, and the task soon proved beyond the horses. The difficulties were overcome by installing a trolley line and coupling a trolley-tractor in front of the line of horse wagons; and the unusual train easily negotiated the hill. The pole of the tractor is flexibly attached so that the train can get out of the way of meeting traffic, the roads being trackless.

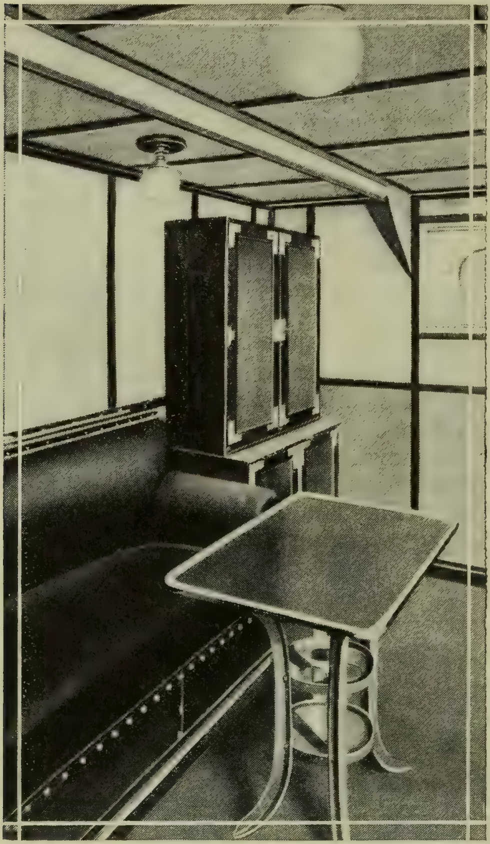
The system is now a permanent institution and trolley-tractors thus convey some 200 loaded horse wagons daily, averaging 5 to 7 tons in weight, up the incline.



The Air-Wave-Producing Siren Mounted on the Bow of an Ocean Liner and Sending Out Vibrations at the Rate of 14 or 15 per Second. When These Waves Strike an Iceberg or Other Obstruction They are Reflected Back and are Caught by the Ship's Mechanical Ears, Mounted on the Bridge. The Insert at the Left Shows the Wave-Sending Siren, and the Insert at the Right One of the Mechanical Ears

ASBESTOS FURNISHINGS ON GERMAN BATTLESHIPS

Asbestos has recently been introduced into the German navy as a material for the interior finish of cabins, passageways, and the like, and as furniture. It is said to combine the advantages of wood and iron without having their drawbacks. It is as cheap or cheaper, and its chief feature is, of course, that it is absolutely unburnable.



Officer's Cabin of a German Warship Furnished with Asbestos Furniture, and with Walls, Ceiling, and Even Picture Frames of the Same Material

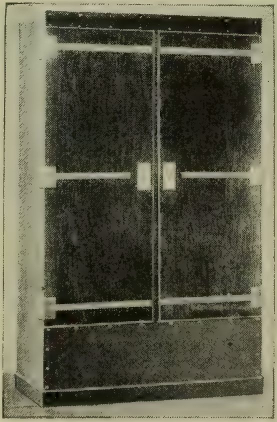
In one of the illustrations is shown an officer's cabin done completely in asbestos, the walls, ceiling, furniture, and even the picture frames being of this material. For the sake of appearance the asbestos has a facing of very thin, polishedwood, which may be finished in any color desired. Tests have shown that the facings of wood will not burn when exposed to a hot flame, owing to the nearness of the asbestos.

The asbestos walls will transmit neither sound, strong vibrations, dampness nor heat. The use of it in construction work and furniture making is said to present no difficulty, as it can be sawed, planed, drilled and nailed like wood.

HYDROELECTRIC POWER FOR PANAMA CANAL

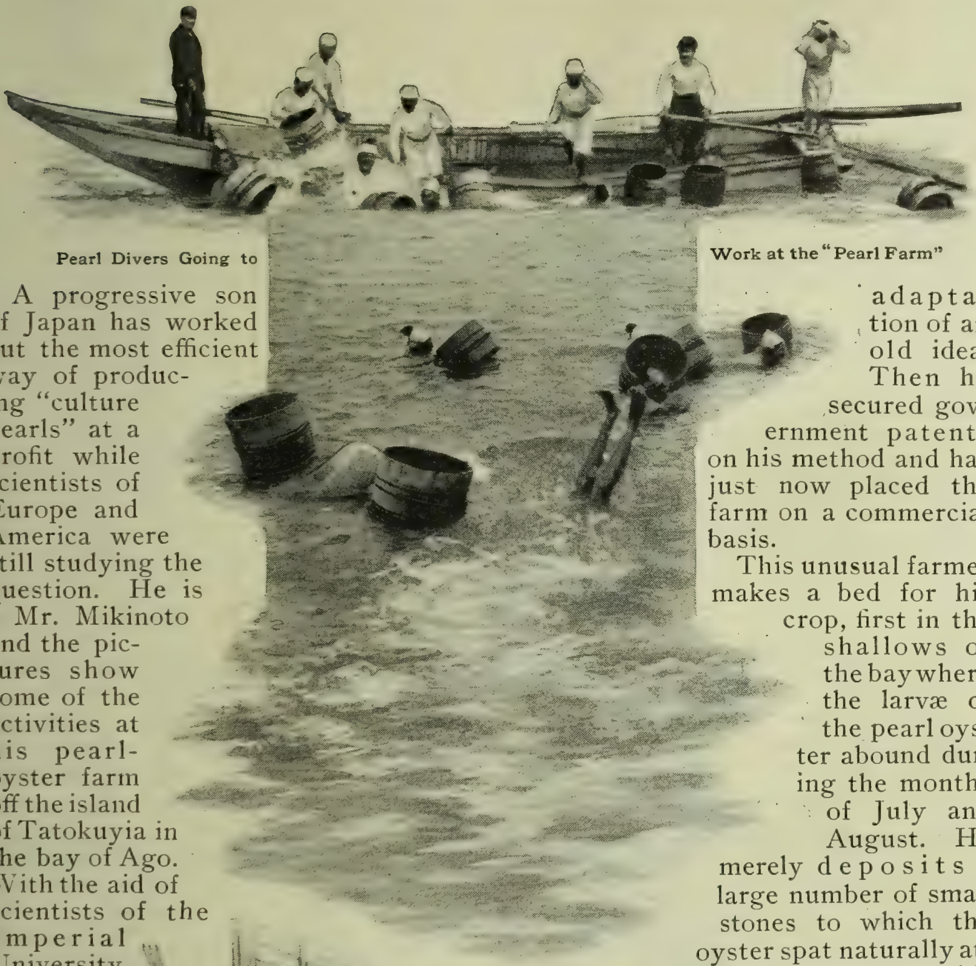
The surplus water at Gatun Lake will be used to supply electrical energy for the Panama Canal Zone, the hydroelectric station being situated adjacent to the north wall of the Gatun spillway. The building will be constructed of concrete and steel, and will be of a design suitable for a permanent power house in a tropical country. The dimensions of the building are such as to permit the present installation of three 2,000-kw. units, and provision is made for the future installation of three additional units of similar capacity as they are required.

From the storage in Gatun Lake, there will be available sufficient water to warrant such an installation. The average head throughout the year will be approximately 75 ft., the elevation of the tailrace being about 8 ft. above sea level. During the rainy season, water will be plentiful and must be wasted over the adjacent spillway. Even during the dry season water will be extremely abundant for several years, until such time as the traffic through the canal approaches full capacity.



A Cabinet Made of Asbestos Faced with a Thin Layer of Polished Wood

IMPROVED METHODS OF "PEARL FARMING"



Pearl Divers Going to Work at the "Pearl Farm"

A progressive son of Japan has worked out the most efficient way of producing "culture pearls" at a profit while scientists of Europe and America were still studying the question. He is a Mr. Mikinoto and the pictures show some of the activities at his pearl-oyster farm off the island of Tatokuyia in the bay of Ago. With the aid of scientists of the Imperial University, Mikinoto spent several years in costly experiments before he developed his adaptation of an old idea. Then he secured government patents on his method and has just now placed the farm on a commercial basis.

This unusual farmer makes a bed for his crop, first in the shallows of the bay where the larvæ of the pearl oyster abound during the months of July and August. He merely deposits a large number of small stones to which the oyster spat naturally attach themselves. Then his diving women transplant the young oysters to deeper waters to protect

Japanese Women Divers Classifying Pearl Oysters them from the cold. Here they lie on carefully prepared beds until in their third year they became full grown, and have firmly attached themselves to the stones by means of "necks" which they secrete.

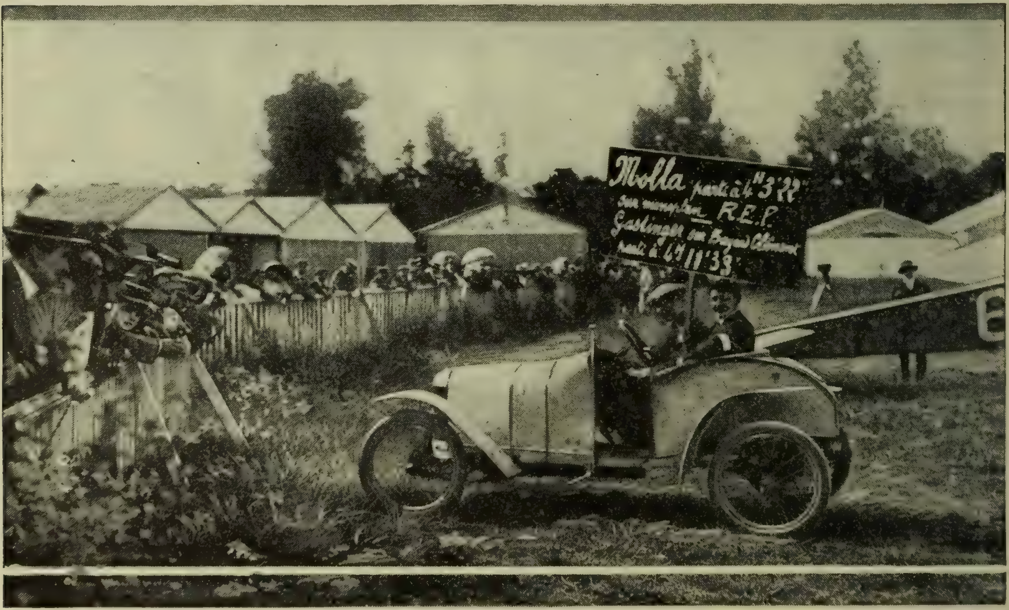
At this time the diving women bring the mollusks to the surface and they undergo an operation. A small seed pearl is introduced into the center of the shell. Then the oysters are replanted in the bed and left alone for four years. When they are again brought to the surface it is found that the seed-pearl nucleus has been covered with many layers of "naore," a secretion of the mollusk, and the large brilliant translucent pearl of commerce has been formed.

But the process is not as simple as it appears. During the seven years that the farmer must wait for his crop to mature, a large percentage of the oysters die. The oyster beds are raided by such enemies as the octopus and the starfish. Occasionally the "red current" sweeps over them and in a day destroys the entire crop. At all times the farmer must keep his oyster bed free of "miruno," a seaweed which will smother the crop.

Women divers trained from girlhood to long immersions in the sea are engaged at 20 cents a day to care for the farm. In this work they wear nothing save a head cloth, a white shirt and diving goggles. At each dive they can gather several oysters and return to the surface. A dive occupies about one minute, and a day's work is from four to six hours. An expert can readily gather 500 oysters a day in a depth of water ranging from two to six fathoms. To keep at the work for a day, they must frequently come up and warm themselves at a fire.

AUTO SIGNBOARD ANNOUNCES AEROPLANE EVENTS

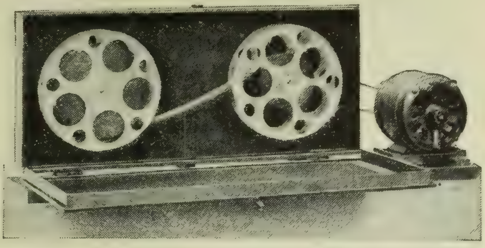
It is often difficult for spectators at a big aviation meet to keep track of the different entries and know just which airman and machine rises at a certain time. The officials of the Paris-Amiens aerial race, which was recently run in France, however, evolved a system of notifying spectators in which an auto-



An Automobile Signboard Used to Announce Events at a French Aviation Meet mobile played a prominent part. When a flight commenced, the name of the airman or airmen, the type of aeroplane, and the time the flight started, were marked on a blackboard which was displayed in an automobile driven along the line of spectators.

FIREPROOF MAGAZINE FOR REWINDING FILMS

A rewinding machine for motion pictures that is absolutely fireproof is the latest patent of a large film-manufacturing company. The machine consists of a magazine of $\frac{1}{16}$-in. seamless sheet steel, 30 in. long, 15 in. high, and 3 in. wide, inside of which are placed the two film reels. When the door of this magazine is closed and latched, the motor pulley may be started and the film rewound without any danger of fire. The motor is $\frac{1}{10}$ hp. and will wind 1,000 ft. of film per minute at a cost of three cents per hour for electricity. The film so rewound by power is tighter and more regularly wound than when it is drawn up by hand, thus lessening the number of scratches that are so objectionable in a "rainy" film.



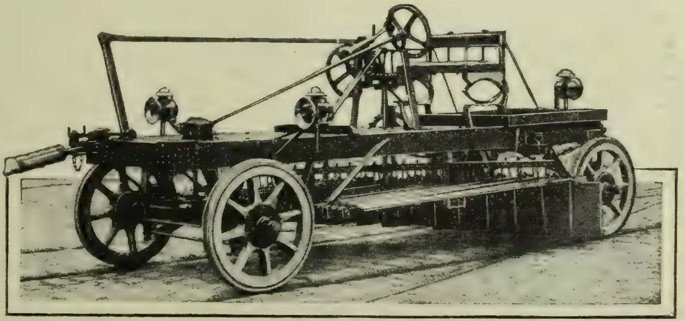
View of the Fireproof Magazine for Rewinding Motion-Picture Film, with the Door Open, Showing the Interior

The machine is of such a convenient size that it may easily be put in the operator's room of the motion-picture theater.

TROLLEY-CAR-DRAWN PLOWS CLEAN STREETS

Clearing the snow from Vienna streets in which electric street cars run is accomplished by attaching two ingenious trailer-plows to a plow-equipped trolley car. The plow of the trolley car throws the snow into the path of the first trailer, the first trailer throws it into the path of the second, and this pushes it into the gutter at the edge of the pavement, thus cleaning the street from the track to the curb in a single operation.

An idea of how this is accomplished may be gained from the accompanying illustration of one of the trailer plows. The front drawbar of this trailer is attached to the extreme right side, so that the trailer will run, not directly back of the trolley car, but at one side, the path of the two barely overlapping. The drawbar of the second trailer, which is likewise attached to it at the extreme right side of the forward end, is connected to the left rear end of the first trailer. Each trailer is provided with steering gear and wheel similar to that of an automobile, so that the operators of each can steer them to just overlap the track of the preceding plow, and also guide them around obstructing traffic.



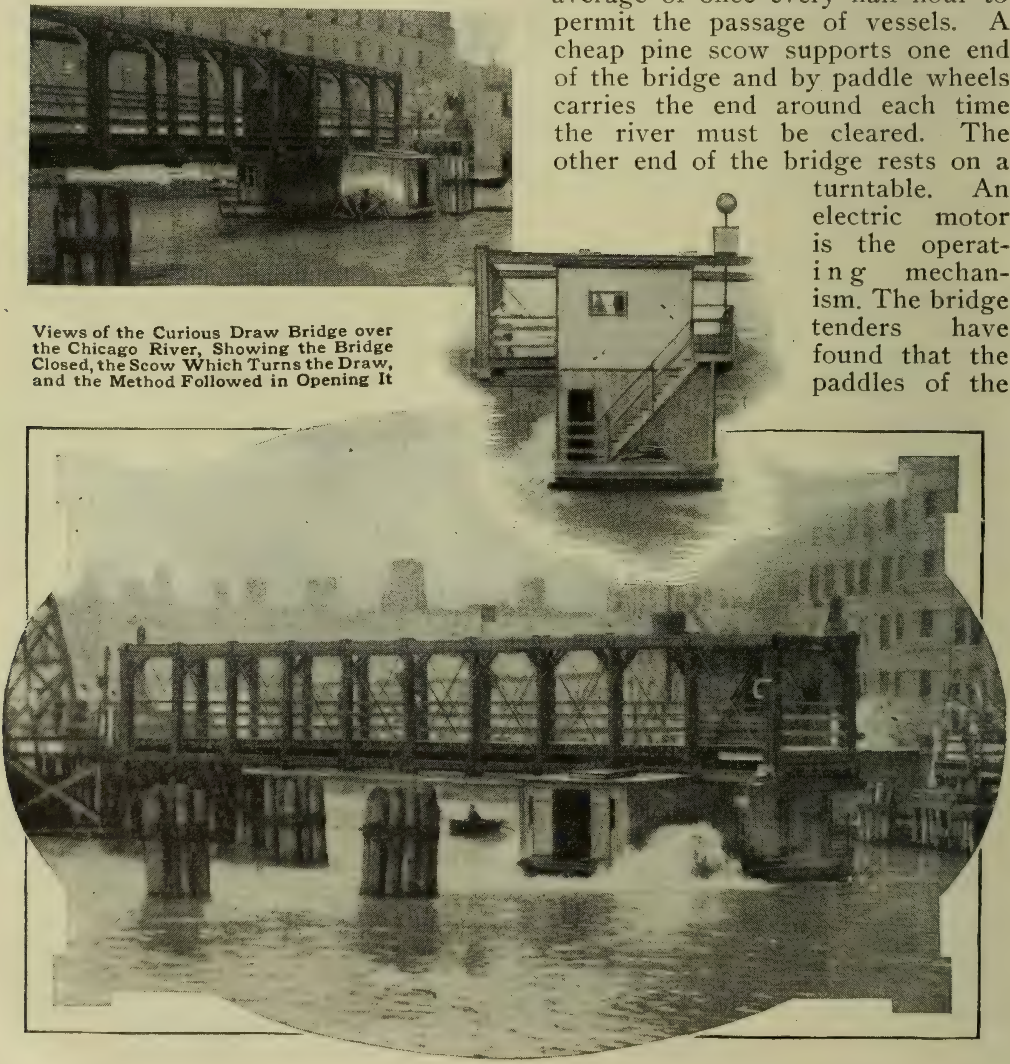
One of the Trailer-Plows Used to Clean Snow from Vienna Streets

PRIMITIVE DRAW BRIDGE IN CHICAGO

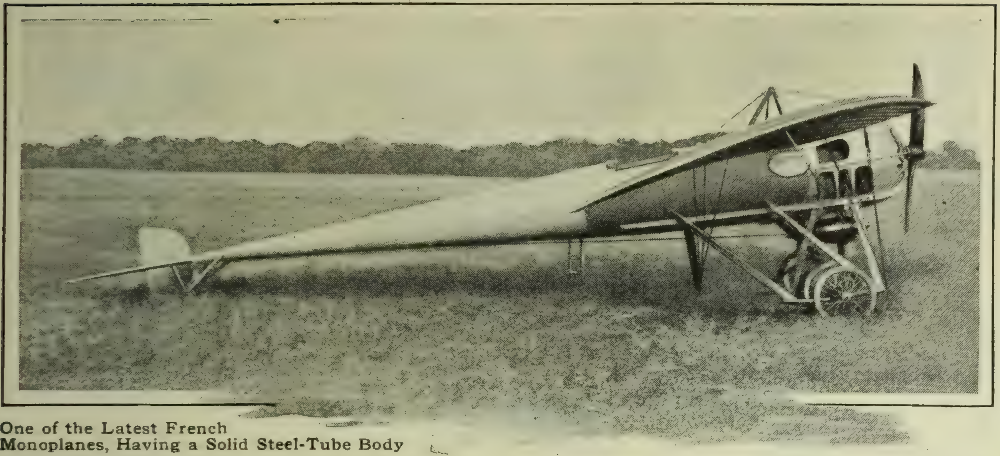
The demands of a congested population have forced the engineering department of the city of Chicago to resort to pioneer methods of bridge building. At Indiana Street on the north branch of the Chicago River a bridge is operating daily which seems clumsy and ridiculous when compared with the new steel structures only a few blocks away, but which satisfactorily serves its purpose.

This bridge connects the Italian section of the city with a market section where the fruit and vegetable venders get their supplies. When the old bridge went to pieces the United States war department refused to let the city build a temporary structure until money was appropriated and a contract let for the new bascule bridge. However, the demands of the people interested in having some kind of bridge at that point finally prevailed, and permission for a temporary structure was granted.

The Indiana Street bridge shown in the picture accommodates 1,600 pedestrians daily. It is swung on the average of once every half hour to permit the passage of vessels. A cheap pine scow supports one end of the bridge and by paddle wheels carries the end around each time the river must be cleared. The other end of the bridge rests on a turntable. An electric motor is the operating mechanism. The bridge tenders have found that the paddles of the



Views of the Curious Draw Bridge over the Chicago River, Showing the Bridge Closed, the Scow Which Turns the Draw, and the Method Followed in Opening It



One of the Latest French Monoplanes, Having a Solid Steel-Tube Body

pontoon are too low in the water and are raising them 18 in. If the pontoon could be allowed to float without ballast this would not be necessary, but in order to make the floor level of the bridge correspond with the level of the approach several hundred pounds of water must be carried in the pontoon. The control of the motor and of the bilge pump is placed in the bridge tender's shelter on the floor of the bridge.

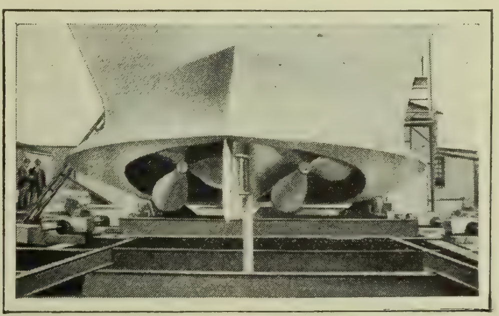
Contractors are now engaged in placing the abutments and substructure for a new $201,000 bascule bridge a few feet upstream from the temporary bridge. It will be 18 months before the superstructure contractors complete the bridge. It will have a span of 140 ft. and a roadway sufficiently wide to accommodate street-car tracks and sidewalks. Meanwhile residents of the district must leave a street car on one side, walk across the foot bridge and take another car to their destination. A similar temporary bridge is in operation a few blocks away, at Chicago Avenue.

MONOPLANE WITH SOLID STEEL-TUBE BODY

The latest Morane-Saulnier monoplane has a body constructed as a solid steel tube, which tapers down to a few inches in diameter at the tail. The streamline effect is said to be exceptionally good. The machine has two seats, arranged tandem fashion, and is driven by a 100-hp. engine.

LARGE SHALLOW-DRAFT MOTOR CRUISER

A cruising motorboat, 82 ft. long and weighing 90,000 lb., yet only drawing 30 in. of water when running at full speed, has been constructed for a Minneapolis yachtsman for cruising in southern waters. The construction is novel, in that it combines a tunnel stern with a yacht upper body. The tunnel construction of the stern, with the twin propellers in place, is shown in the illustration. One of the particular features of the construction of the stern is the so-called "chine" piece, an awning-like projection from the hull which extends well under the water line over the propellers and prevents

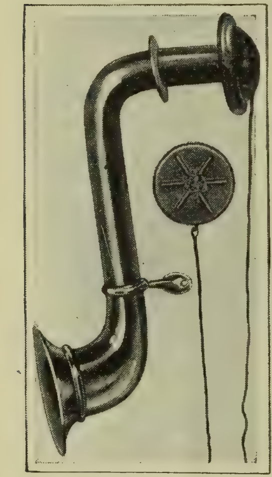


The Tunnel Stern Which Makes an 82-Ft. Motorboat Draw Only 2½ Ft. of Water floating debris from being sucked down and tangled up in them.

With the ordinary type of motorboat of 40 ft. or more it is practically impossible to reach the most interesting parts of Florida, owing to the shoal water.

A LOUD-SPEAKING AUTO TELEPHONE

A particularly loud-speaking telephone outfit, by means of which the occupant or occupants of a limousine automobile may give directions that will be heard by the chauffeur even though pronounced without raising the voice above the conversational pitch, is shown in the accompanying illustration. The sound-receiving end of the instrument is a little disk suspended within a pocket of the upholstering of the car, and is connected by wire to a powerful reproducer affixed to a horn-shaped megaphone. The apparatus may be connected to any 6-volt battery.



FLIES HIGHER THAN TOP OF PIKE'S PEAK

At Leipzig, Germany, on July 7, Hellmuth Hirth set a new aeroplane altitude record by ascending to a height of 4,420 meters. This is equal to 14,501 ft., and beats the previous record held by Garros, by 1,673 ft. That this sort of flying places mountain climbing rather distinctly in the shade, will be appreciated when it is realized that Hirth soared higher than the top of any mountain in the United States, with the exception of two or three in Alaska.

CULTIVATING A FLY-KILLING GERM

Swatting, tanglefoot fly paper, traps, poison, and other methods and devices for catching and killing the ubiquitous fly, will soon be things of the past, if the new fly parasite, just discovered, proves as deadly as its discoverers believe it to be.

This new hope of carrying to a successful end a war of absolute extermination against the fly is found in the discovery by two English physicians, Drs. Edgar Hesse of Brunswick Park, New Southgate, and S. Monckton Copeman of the Local Government Board, of a microscopic fungus or mold, so small and so fatal to flies, that if one fly is inoculated with this germ, and then set free, an epidemic disease will spread among flies to such an extent that the insects will die by the thousands and literally drop "like flies" in all directions.

This germ is so small that when planted in gelatin or "agar"—a sort of gelatinlike moss—the colony does not become visible until billions of descendants have developed from the mother mold, which only requires some hours, and then the multitude only appears as large as a pinhead.

It suffices to barely touch this colony with a sharp needle and then scratch a few live flies with its point. When set free, these inoculated flies will cause an epidemic and contagious malady among their kind that will, according to the English scientists, stop short of nothing but complete annihilation.

The microbic mold is harmless to human beings, dogs, cats, and domestic animals generally. It is therefore easy to handle and results in no damage to anything but these winged pests.

Although it is too late this year to expect much successful experimentation with this new fly disease, government bacteriologists have ordered many test tubes full of these fly killers, and hope before next year to have completed trials of the microbe on the American houseflies.

SEARCHLIGHTS TO GUIDE FISHING DORIES

Electricity is now rendering a little less dangerous the operations of the fishing fleets of the North Atlantic coast, whose men brave perhaps more dangers than any other class of workers. An electric searchlight—a modification of the well-known electric automobile searchlight—has been installed upon almost every vessel of the Gloucester and T-Wharf fishing fleets, and although these lights have been in operation less than a year they have already been instrumental in saving several lives.

The searchlights take the place of flare torches on the vessels, and as the new devices are powerful enough to pierce the thickest fog or darkest night for a long distance, and at the same time are small and light enough to be carried by hand from place to place about the vessel, it can readily be understood that they are of great value. By long experience the fishermen have come to know that fog is their principal enemy. A study of the long list of disasters of any past year will quickly prove that the majority of deaths and accidents have been caused by single fishermen straying off in their dories in the fog. As a rule a fisher-

With a Brilliant Beam of Light, Dory Fishermen on the Dangerous Grand Banks may Now be Guided Safely Back to Their Schooners man leaving in his dory, even in thick, foggy winter weather, carries nothing with him but his trawl lines. He has been off alone in a dory perhaps a thousand times, and has returned to his vessel in safety. He may leave his vessel in clear bright weather, and before he finishes his work, which sometimes takes him several miles from the schooner, a thick bank of fog may have surrounded him, cutting him off from all communication with the rest of the world. If he is an experienced fisherman, he may be able to tell from the direction of the wind, from the flow of the waters and from a sort of sixth sense, which old seadogs seem to possess, where his ship lies. There is but one thing to do—take his oars and row. And many a time the doryman will row in the wrong direction. He may circle around his schooner for hours, for days in warm weather without realizing his proximity to it. Cases have been known where dorymen passed almost beneath the bowsprit of their vessels and still were not picked up. His chances of reaching his vessel are even lessened by the fact that while he is endeavoring to row toward the schooner, the latter has hoisted sail and is sailing in a circle trying to find him.

In recent fogs where dorymen have strayed off in this fashion, Capt. Matthew Greer and other well-known skippers have found that by playing their searchlights over the waters and keeping their vessel in the same spot, the rays from the light have reached the dorymen and guided them toward the schooner.

Next in importance to the question of the single doryman and the fog, the disaster list shows that collisions with other craft, especially with freight steamers, figure. Upon the Grand Banks of Newfoundland, where the European passenger steamers ply back and forth, this form of accident is common, although since the general introduction of searchlights upon the large passenger-carrying boats, the number of such accidents has grown less. It is figured that by the introduction of searchlights aboard the fishing boats which frequent these grounds, it will be possible for the fishermen to give timely warning of their presence by simply throwing their searchlights to the bridge of the oncoming liner in time for the latter to slightly alter its course.

Coming out of Provincetown Harbor of a dark, misty night this spring, Captain Greer, standing on the quarter deck of his schooner, the "Mary B. Greer," suddenly heard the sound of a steamer's propeller slashing the waters nearby. With the sole exception of this sound, the exact whereabouts of which it was impossible to gauge, there was no means of knowing that a steamer was in the vicinity. Grabbing his searchlight, which lay on the wheelbox beside him, Captain Greer switched on the current. He was in the nick of time, for a minute later the prow of a good-sized steamer which was rapidly approaching would have cut through his vessel amidships, with the result that the ship would have been a total loss and most of the men probably drowned. As it was, the light, soaring upward, filled the eyes of the commanding officer on the bridge of the steamer, who immediately changed his course enough to avoid collision with the smaller craft.

Capt. Enos Nickerson, out on Georges Banks with his new schooner, the "Pontiac," of a dark night recently, had his main topmast carried away by a sudden gust of wind. The topmast, broken off close to the mainmast, hung down in the main rigging, hindering the navigation of the vessel. In the old days the only thing to do would have been to light a flare-torch and send a man aloft with it, a process which more than once resulted in a serious fire aboard fishing boats. But under the new order of things Captain Nickerson had only to switch on his searchlight, which, turned upward, flooded the whole upper rigging with light and enabled two of the seamen to quickly cut loose the broken topmast and put the ship in navigable shape.

Photo by P. J. Press Bureau

Hunting in a Preserve Backed by Tall Buildings and Ending the Hunger of a Stray Mongrel with a Bullet

MAN PRIVILEGED TO HUNT IN NEW YORK PARKS

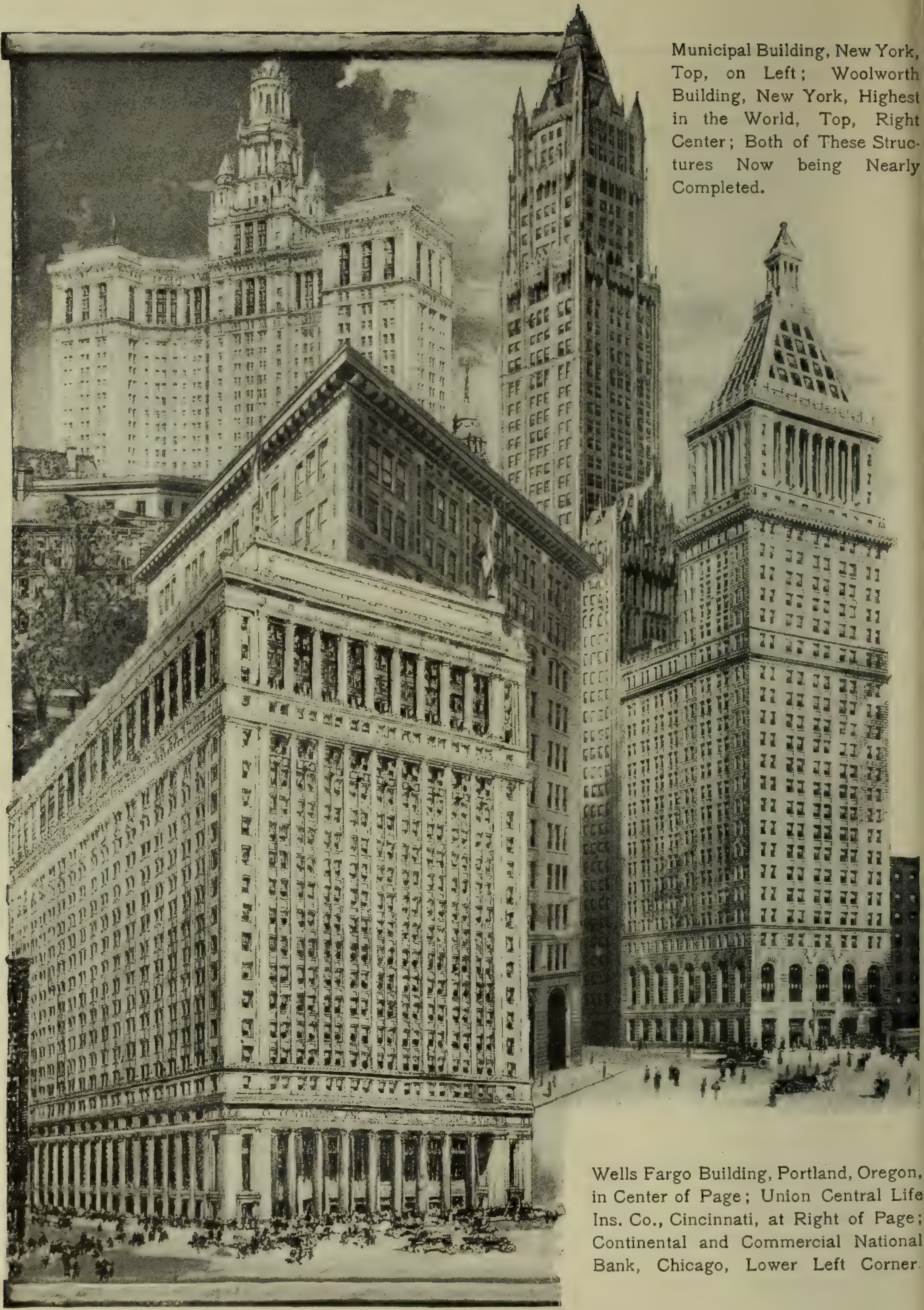
The privilege to hunt in New York parks, although the game is very humble game indeed, with the exception, once in a while, of an eagle, perhaps, and quite often a big hawk, is granted to only one man. This man is Arthur Hassler, a sharpshooter of the National Guard, now in the employment of the Department of Parks. He has been commissioned to kill off the homeless dogs and cats, and to protect the swans and other waterfowl, sheep and privileged live stock from the attacks of hawks and rats.

The "official hunter of the parks" has no fixed "beat," but goes where the game is most likely to be found. In the early morning he may be, perhaps, prowling around the upper part of Central Park stalking cats. In the afternoon he will probably be seen silently watching the rocking sides of the lake, waiting for a chance to put a bullet into one of the numerous rats which make life miserable for the swans and ducks. Or he may be found watching the skies for the appearance of one of the great hawks which come soaring over from the Jersey side in quest of a meal in Central Park.

SKYSCRAPER STYLES OF 1912

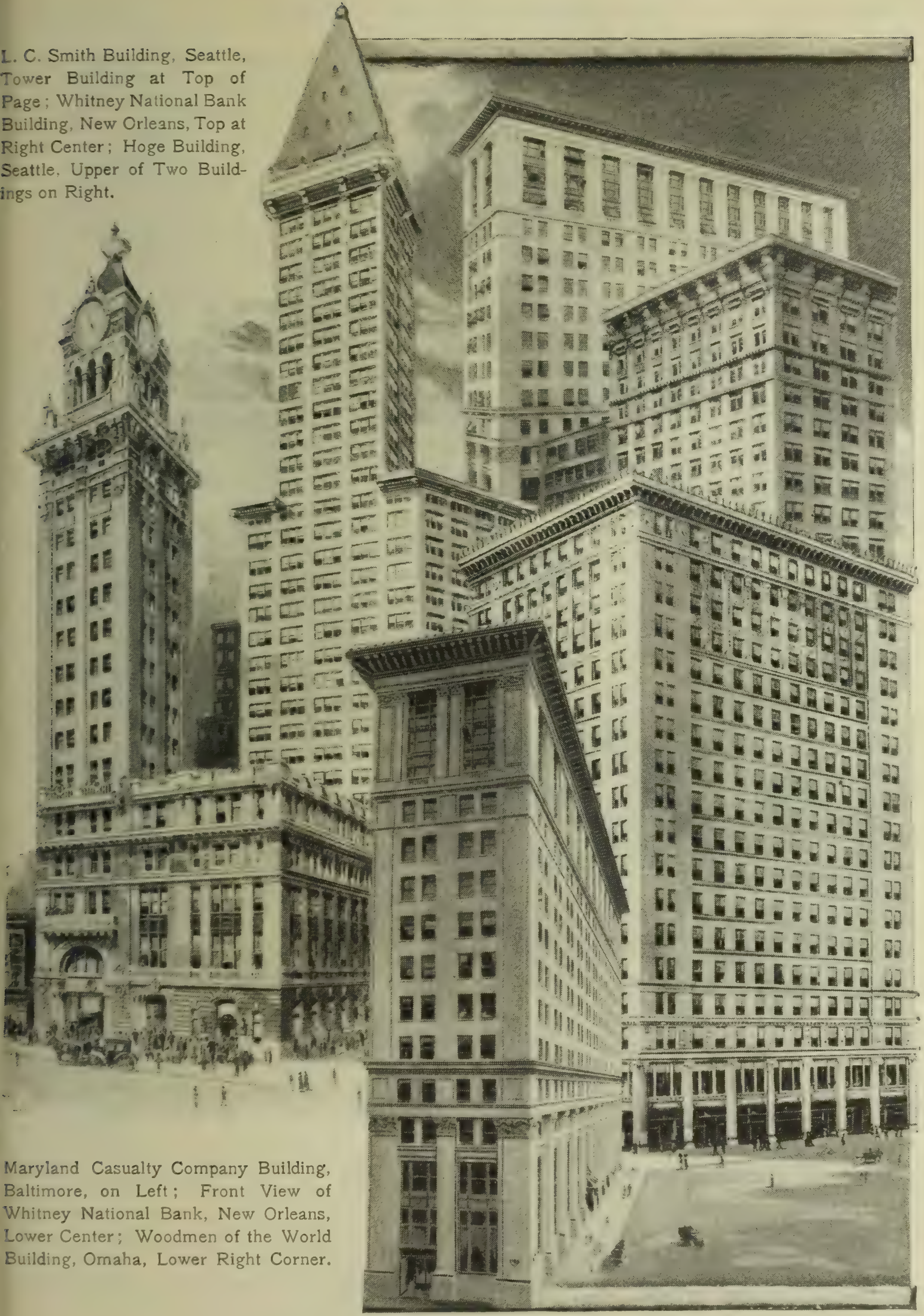
"Impressive as the cliffs of Toledo," is the phrase used by a prominent architect in describing how Michigan Avenue, in Chicago, would appear if its skyscrapers were designed as large-scale compositions of line and mass, without recourse to the conventional styles, each building harmonizing with its neighbor. A new school of architects, believers in this style of design, is now coming to the front in smaller buildings, and it is only a question of time when these architects will invade the skyscraper field. In the meantime architectural details and ornaments are Classic, Romanesque, Gothic or Renaissance, according to the preference of the architect or owner,—and a city

Municipal Building, New York, Top, on Left; Woolworth Building, New York, Highest in the World, Top, Right Center; Both of These Structures Now being Nearly Completed.



Wells Fargo Building, Portland, Oregon, in Center of Page; Union Central Life Ins. Co., Cincinnati, at Right of Page; Continental and Commercial National Bank, Chicago, Lower Left Corner.

L. C. Smith Building, Seattle, Tower Building at Top of Page; Whitney National Bank Building, New Orleans, Top at Right Center; Hoge Building, Seattle, Upper of Two Buildings on Right.



Maryland Casualty Company Building, Baltimore, on Left; Front View of Whitney National Bank, New Orleans, Lower Center; Woodmen of the World Building, Omaha, Lower Right Corner.

street is a jumble of all these styles. But, broadly speaking, certain principles are coming to be recognized, and the buildings being erected this year show a decided advance in the adoption of these principles by architects generally. When the construction of skyscrapers first began, architects were at a loss to devise a style of treatment suited to what was called "a building set on end." Bruce Price, a New York architect, conceived the idea of designing such buildings in a way analogous to a column—that is, as base, shaft and capital. This treatment is now generally followed. The base is usually three stories in height, with strong horizontal lines, and serves to break the vertical effect of the middle or shaft section. The capital, or architectural attic, serves the same purpose at the top of the building. In the middle section the vertical lines are accentuated. In this way the building forms a complete composition, having a beginning, a middle and an end.

Another tendency shown in skyscrapers now being erected is the tower, divided into stories and utilized as rentable space, resting on a building that would be a skyscraper without it. The Woolworth building in New York City, the highest office building in the world, is an example of this style of treatment. In this type of building, the attic of the main structure is less prominent than in the other type, and the top of the tower is strongly developed in order to terminate the vertical lines.

Lots of ordinary size in the congested districts of New York and Chicago are now sold as high as $18,000 a front foot. With land at this price the skyscraper is a commercial necessity. The erection of a skyscraper increases the value of the land it occupies as well as that of adjacent land, and it is impossible to guess where the limit of height will finally be placed. A thing often discussed is the limit of height on account of the increasing space required for elevator service. This limit, whatever it may be, is not even approached in buildings of large ground area now being erected. A leading elevator company estimates roughly that one square foot of elevator area is required for each five hundred feet of office space. Twenty high-speed elevators are sufficient for a building twenty-two stories high and covering half of a city block, while twice this number might be installed without serious loss of floor space. The limit is not now imposed by the elevator service. But there is a limit due to the darkening of the streets by excessively high buildings. Even this may be overcome by building these structures as stepped pyramids, as is now proposed, each tenth story being set back from the line of the stories below, the whole rising a hundred stories or more into the air and terminating in a central tower. The skyscraper of 1912, large and imposing as it appears at the present time, may seem insignificant 20 years from now.

PANAMA CANAL ZONE POPULATION

The census of the Isthmian Canal Zone, taken the early part of this year, shows a total population of 71,682 persons. Of this number 8,872 were employes either of the Canal Commission, of the Panama Railroad, or of contractors, and, while employed in the Zone, resided in Panama and Colon. Of the 62,810 actual residents of the Zone, 19,413 are white, 31,525 black, 10,323 mixed, 521 yellow, 378 Hindoos, and the remainder Indians.

The census of 1908 showed a population of 50,003. Strange as it may seem, Great Britain leads in the present census with 30,859 persons, if classified by citizenship. The United States, which is second, has 11,850, of whom 9,770 were born in the United States.

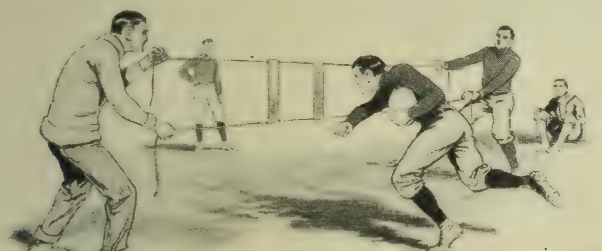
ℭLieut. Chandenier, of the French army aviation corps, was burned to death while flying in his machine the latter part of August.

DEVICES USED TO CREATE INSIDE FOOTBALL

By THOMAS KIRBY

While much has been written of the recent development of "inside baseball," the intricate game of the highly skilful players, comparatively few of the thousands who attend the annual football games each fall know of the many difficulties experienced by trainers and coaches in priming players for these gridiron classics.

Each season witnesses new contrivances which are used as aids to the mentors in helping to ground their charges in the rudiments in the most strenuous of all intercollegiate sports. The tackling machine, a suspended dummy which is tackled by candidates before the regular practice each afternoon, and the charging machine, a sled with uprights and crossbars against which the linemen plunge to develop a fast "charge," were among the earliest inventions. The success which attended their introduction led to their universal adoption.

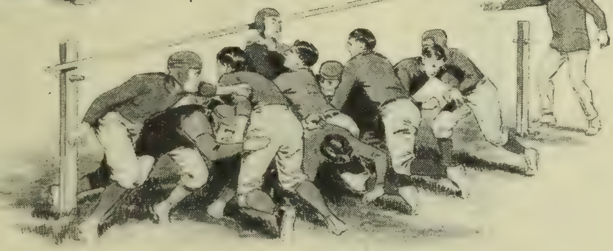


The "Bucking Strap" Designed to Teach Football Players to "Pick a Hole," in the Defence

Now comes the "bucking strap" and the "charging fence." The former consists of two parallel pieces of leather or canvas, connecting two stretches of rope. The square, formed by the leathers and the ropes, is large enough to allow the head of the player to enter and at the same time small enough to check the forward progress of the shoulders. The ball is passed to a back who plunges forward, but instead of ducking his head and simply "bucking," the player is forced to keep his eyes up, lest a slight movement of the ropes, held at each end by other players, will mean the driving of his head solidly against the leathers, instead of going through the square.

The object of this device is to teach backs to "pick a hole" when they are called upon to carry the ball through an opposing line, instead of going blindly into a mass of players.

The charging fence is simply a loose pole between two uprights. The posts are about four yards apart and under the crossbar two lines of candidates for the forward positions are pitted against each other.



The "Charging Fence," a Device Which Enables a Football Coach to Give Instruction in, and a Team to Learn Accurately the Value of the Low Charge against a Formidable Lineup

The fence is considered the last word in drilling linemen to charge low.

The ball is snapped and both lines start forward. The lower the man goes, the better are his chances, for, once he get under an opponent, he is able to rise and shove his rival's head or back against the crossbar. This means the man lower is praised and the one higher is condemned by the coach who appreciates the absolute necessity of having a fast, low line, not only on the defense but on the attack as well.

Under the rules that go into effect this fall, the distance to be gained each down will be less than in the past few seasons, meaning there will be an especial premium on ability of backs to "pick holes" in the line when advancing the ball, while the line, in order to stop quick plunges, must play lower than has been the order since the modern system of play followed the revolutionary changes in the rules of a few years ago.

TELEPHONE INSTRUMENTS MASQUERADING

In one of the loud-speaking telephone outfits manufactured in Paris and designed to be used for communication within the house; the instruments are hidden in flower vases, which may be placed on the dining-room table, on a table or mantel in the living room, or in the bedrooms. The receiver and microphone are mounted in the base of the vase, a small plug and a flexible cord serving for the connection with the battery. A push button rings a bell in the kitchen or servants' rooms, and the woman of the house can transmit her orders without having to call the servants to her.

There are several variations of the idea, such, for instance, as an ornamental dish holder, or an odd-looking ornamental figure.

HYDRO-AEROPLANE ATTEMPT UPON CHANNEL FLIGHT

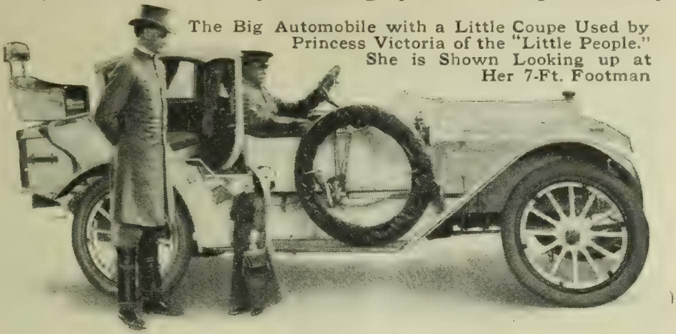
Despite the fact that the English Channel is only 21 miles wide, and that it has been crossed not less than threescore times by aeroplanes, its historic importance as the means of preserving the insularity of Britain is so great that each new record for crossing it becomes news of world-wide interest, a source of much satisfaction to the flight enthusiasts, and the cause of a not unreasonable apprehension to the British newspapers. The latest thing in the channel-crossing line is in the way of a prize that has been offered for the first hydro-aeroplane to get across. Already there have been placed on record, in addition to Louis Blériot's never-to-be-forgotten first crossing, the fastest crossing, the first round-trip flight, the first biplane crossing, the first crossing with a passenger, the first crossing by a woman, the first crossing by a woman pilot, and the flight with a maximum number of passengers—three, so far. As yet, however, there has been no crossing with a hydro-aeroplane, though one of these machines has already made an unsuccessful attempt, but when the feat is achieved, it will have at least the importance of being the first use of the new air-water craft for definite travel across water.

AUTOMOBILES FOR NAVAL LANDING PARTIES

The Naval Militia of California recently demonstrated the possibility, under certain conditions, of using automobiles to transport landing parties. A crew of 33 officers and men, and a one-pounder weighing 800 lb. were transported from Los Angeles to Pasadena in 21 min. The gun, which was mounted on the tonneau of the largest of the three cars, rode perfectly. This car also carried the officer in command and the gunners. The second car carried the caisson and 10 members of the crew, and the third car carried 13 men.

MIDGET ACTRESS HAS CAR OF UNIQUE PROPORTIONS

One of the smallest "little people" on the American stage, known as Princess Victoria, has an automobile built to fit. The machine as a whole, however, is not miniature. It is just the coupe that is built to fit, and the reasons are as follows: In the first place this little person requires, as do all successful actresses, a car driven by a regulation chauffeur, and there are no regulation chauffeurs of a size that could ride comfortably in a car built in proportion to her own scale. In the second place her requirement is for a car that will travel fast, and with a dignity which a really small car could not very well provide. And in the third place, her footman, who must ride on the rumble seat at the rear of the coupe, is 7 ft. tall.

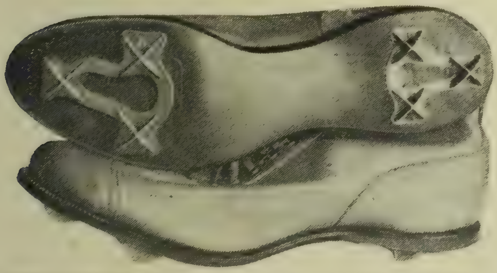


The Big Automobile with a Little Coupe Used by Princess Victoria of the "Little People." She is Shown Looking up at Her 7-Ft. Footman

Princess Victoria, who is 23 years old, 25½ in. tall, and weighs 25 lb., has to have special means of reaching the running board of her machine and then getting "upstairs" into the coupe. A toy folding yacht companionway, which folds up under the running board when not in use, suffices for the first part of the climb, and a little set of steps mounted on the running board against the rear mudguard completes the stairway.

A NEW SPIKE FOR BASEBALL SHOES

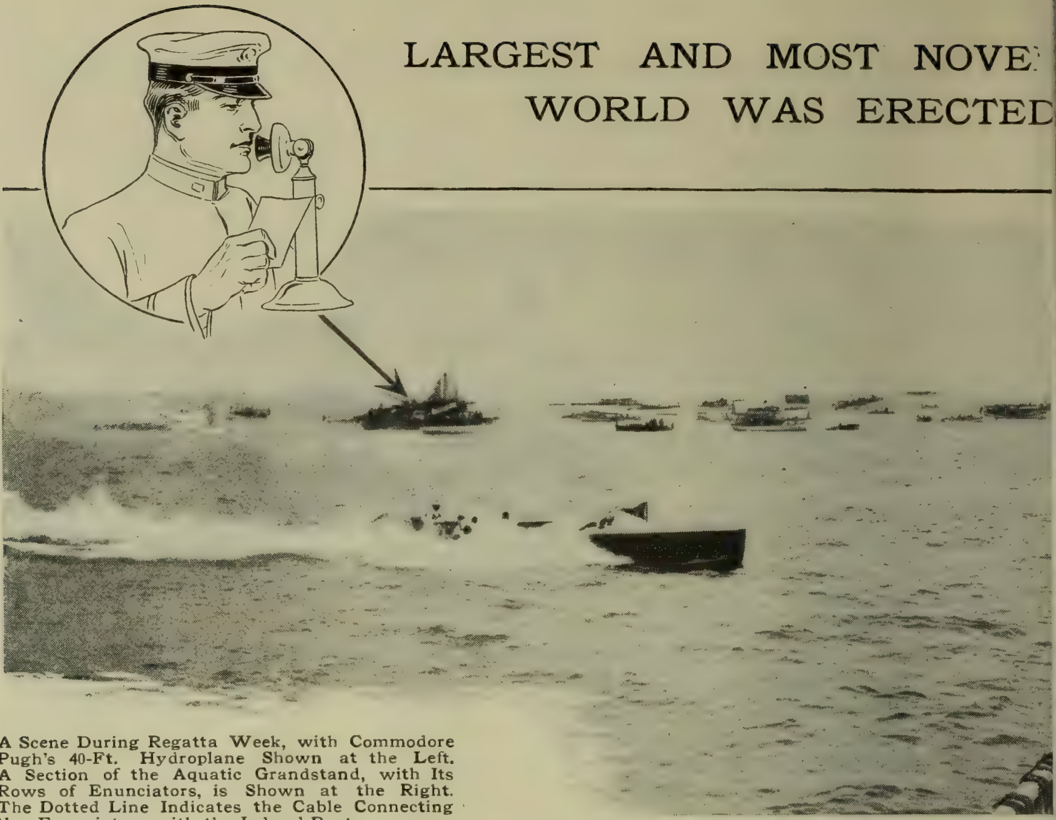
A new type of spike for baseball shoes, claimed to be a great improvement in that it will not tear the flesh of any player it comes in contact with, is here shown. The shape of the new spike plate is like that of the old, being triangular, but the spikes proper comprise two semicircular blades of metal crossing at right angles. This eliminates the points and each end guards the other when it comes in contact with the player's flesh or clothing. Tests are claimed to show that this form of spike is no more liable to fill up with soil than the old type of spike, as the blades are perpendicular and both edges are beveled. Next to its non-cutting qualities, the main advantage of the new spike over the old, lies in the fact that it always has the same hold on the ground at any angle.



Baseball Shoes Equipped with Spikes That Will Not Tear the Flesh

ℭTelephone statisticians have found, by investigation and comparison, that the average London telephone operator consumes 5.1 sec. answering a call and 28.6 sec. in getting connection with the number wanted, while in Chicago the corresponding averages are 3.1 sec. and 25.4 sec., these averages being based on 50,000 calls.

LARGEST AND MOST NOVE WORLD WAS ERECTED



A Scene During Regatta Week, with Commodore Pugh's 40-Ft. Hydroplane Shown at the Left. A Section of the Aquatic Grandstand, with Its Rows of Enunciators, is Shown at the Right. The Dotted Line Indicates the Cable Connecting the Enunciators with the Judges' Boat

A remarkable aquatic grandstand, and the method adopted to keep the vast audience informed of every detail of the races, were features of Chicago's regatta week, August 10-17. The regatta was held to draw the attention of Chicago to the fact that it has a lake fit for small craft, both sailing and motor-driven, as well as for large steamships.

Half a mile out in the lake, and running parallel with Grant Park, which is the very center of Chicago's lake front, is a government pier, which forms the outer breakwater of the harbor. Upon the top of this breakwater, for a stretch of nearly half a mile, were erected grandstands, facing out into the lake, and having a seating capacity of between 15,000 and 20,000 persons. Several passenger boats transported the spectators from the mainland to these seats, in front of which the speeding hydroplanes flashed past at times almost as close as do racing horses in the big ring of a circus. In each section of seats, mounted as shown in the illustration, were placed automatic enunciators, connected up by wires and cable with the judges' boat, anchored 700 ft. farther out in the lake. Thus detailed information as to the ownership, history, record, and dimensions of the craft engaging in the carnival were given directly to the spectators, along with the announcement of the starts in the different events, the winners, etc.

During lulls between races, and there were many, the vast audience was entertained with music transmitted to them by the enunciators, and, still more interesting, during one of the night programs, Mayor Carter H. Harrison of Chicago, Bishop Samuel Fallows, and several other prominent speakers, aboard the yacht "Marigold," anchored 500 ft. from the stands, made addresses which were transmitted in the same manner.

In the hydroplane races "Baby Reliance II," the little 20-ft. boat owned

AQUATIC GRANDSTAND IN THE IN CHICAGO FOR REGATTA

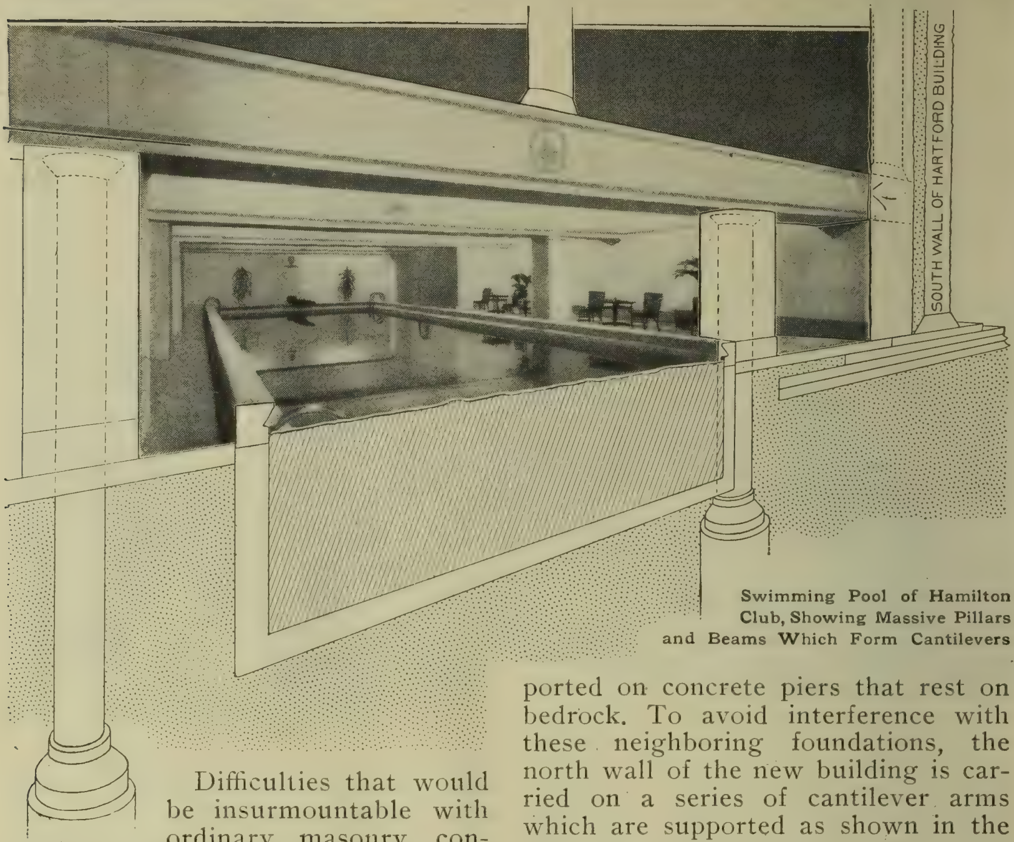
by Commodore J. Stuart Blackton, of New York, showed herself to be the undisputed western champion, winning the beautiful $5,000 Wrigley trophy, as well as several other cups and large cash prizes. Phenomenal bursts of speed were lacking, but "Baby Reliance II" showed her ability to keep going almost indefinitely at speeds of over 40 miles an hour, which is remarkable. James A. Pugh's 550-hp., 40-ft. "Disturber III" was a disappointment. Of the eight hydroplanes appearing for the meet, only four were in commission at the end of the week. During the period of the regatta, three boats sank, and out of a total of 14 events, there were but three in which all the starters finished the entire race.

In the chief event of the sailing races, which was the international race between the "Patricia" of the Royal Canadian Yacht Club of Toronto, and the "Michicago," of the Chicago Yacht Club, the Canadians captured the championship of the lakes by winning three out of the four races.

INTERESTING FEATURES OF DEEPEST BORE HOLE

The sinking of the deepest bore hole in the world, located at Czuchow, Silesia, and reaching a depth of 7,350 ft., consumed a total of 813 working days and cost $75,000, or over $10 per foot. From 1,880 ft. downward the boring was done with diamond drills, over 700 carats of diamonds being consumed. At a depth of 7,200 ft. the whole drilling outfit weighed over 15½ tons. The total weight of the metal tubes with which the bore hole is lined is no less than 280,000 lb. Near the bottom of the hole the temperature registered 182 deg. F.

CARRYING A SKYSCRAPER ON A CANTILEVER



Swimming Pool of Hamilton Club, Showing Massive Pillars and Beams Which Form Cantilevers

Difficulties that would be insurmountable with ordinary masonry construction are comparatively easy of solution when the modern steel skeleton is used, and the problem for the modern architect is not in the construction, but in expressing unusual structural features in such a way as not to offend the eye. A difficulty often met with in the erection of high buildings is the interference of the foundations of an existing building with those of a new building being erected on an adjoining site. A pronounced case of this kind occurred in connection with the recently completed building of the Hamilton Club in Chicago. The Hartford building, which occupies the adjacent lot on the north, is supported on grillages, or the so-called "floating" foundations once in common use. These foundations project about 10 ft. into the Hamilton Club lot. The new structure is supported on concrete piers that rest on bedrock. To avoid interference with these neighboring foundations, the north wall of the new building is carried on a series of cantilever arms which are supported as shown in the accompanying diagram.

Fifteen stories will ultimately be carried on this simple structure. For resisting the heavy stresses, the girders are necessarily of greater depth than the floor, and project below the basement ceiling. As will be seen from the accompanying view, the architect has seized on this as an opportunity for the development of a series of massive pillars and beams, thus giving appropriate and striking architectural expression to a structural necessity.

¶The French Antarctic expedition in the ship "Pourquoi Pas" is the first polar expedition that ever returned to civilization with its entire membership in perfect health, according to a report by Dr. Liouville, surgeon of the expedition.

COMMENT AND REVIEW

"S-O-S" Save Our Streets

THERE are so many new "reforms,"—about one a minute, like the boats at Detroit—that the average citizen dodges at the mere suggestion of another. But here is one that is practical, and should sound good to owners of property on paved streets. In most American cities the completion of a new pavement seems to be the psychological moment for some gas or electric company to discover that it needs new or additional mains, and up comes a long stretch of the new street. To be sure, the ditch is filled and the surface replaced in a more or less careless fashion, but we all know that that particular portion of the street is never the same again. Or it may be the property owner,—who usually lives on the opposite side of the street,—who wants connection, and so in goes another ditch, this time at right angles. The contractor makes a bluff at replacing the paving, but for years to come there remains a ridge or a hollow to mark the spot. For some reason everybody, including even the abutting property owner, seems to regard the street surface with utter indifference. Some pillage it like a Goth, while others consider the proposition with the hopeless despair of a polar bear in a cage.

Isn't it about time we learned something from the other side? For years the "highway" has been a thing sacred to the people. Even so long ago as the building of the first tramway in London, George Francis Train, an American, was put in jail for "tearing up the King's highway," because he had dug up a block or so beyond his permit. In many European cities the problem has been solved, and there seems no good reason why it cannot be solved here in the same way. No individual nor company is allowed to break the surface of a street or excavate the street. When either course is necessary, the city makes the opening and, after pipes or wires are laid, restores the paving in the best possible manner. And the city charges only actual cost, but collects enough to insure the best possible job that can be done. In this way the temptation to hurried, neglectful, indifferent work is avoided; the public are insured a minimum of annoyance while the work is being done and a maximum of excellence when completed.

What we need in many of our city administrations is some one big enough to send out the call for help and get the right answer; the "S-O-S" in this case meaning "Save Our Streets."

* * *

Passing of the Runaway Boy

FOR a boy to "run away" from his home fifty years ago was anything but an infrequent occurrence; in fact, it was looked upon often as an evidence of smartness in the youth. That he had a good home and kind parents did not seem to count for much. There were two bright, glittering goals which stood out against the sky, overtopping all the rest: One was to run away to sea; the other being to go west and fight Indians. The choice largely depended on the distance the young adventurer lived from the ocean. Today the young man seeks success in a very different way.

The passing of the sailing ship with its long voyages to far away and little known ports and peoples is largely responsible for this. Then the opportunities to win fame and fortune in more or less gallant deeds were not uncommon. Such vessels went armed, lending a charm for the would-be sailor. There was, moreover, the opportunity of developing into both a good sailor and shrewd business man, for in those days the character and profit of the return cargo was left to the judgment of the captain. Now the captain of a merchant ship has as much to say about his cargo as the conductor of a freight train. Cable and wireless messages from the main office settle the buying and shipping. Return cargoes are bought and sold again before an outbound ship is half way to her destination. These conditions have reduced the chance for rapid promotion and easy fortunes to the working basis of any ordinary line of business on land. As for the young Indian fighters, they have disappeared with the redmen and the blood-and-thunder literature. The boy of today goes in for all forms of electrical work; he has wireless in the attic and his antennæ rise from housetop and barn; he builds steam engines, and does all kinds of work in wood and iron and brass; he is a more expert photographer at fifteen than the professional of a generation ago. Instead of the old yellow-back dime novel, he reads magazines and monthlies devoted to mechanics and other useful arts. He can tell you more details of the American Navy than his father ever knew.

The old days will never return. Now, if a boy desires the best marine training the world offers, he joins the American Navy, and he doesn't have to run away from anything to do it; in fact, he has to be a pretty fit subject to be accepted and secure the wonderful advantages of training and travel which our country provides its young men.

* * *

More Caution in Flying

SO much progress has been made in the art of flying that the layman has been unprepared for the series of disheartening fatalities which for weeks past have been of almost daily occurrence. Already, the death roll for 1912 is not only large, but includes many airmen who were reputed to be experts. It is true, of course, that while the total is large, the percentage is rapidly decreasing, for at the opening of the season there were not less than 6,000 accredited airmen. Possibly some of these, made bold by past immunity from serious accident, relax their caution and pay the penalty. Yet in many cases carelessness is not given as the cause. The mysterious and ever-to-be-feared air pocket constantly lurks as an unseen foe. The navigator in water has something substantial to aid him in avoiding danger; shoals, reefs, currents, even the wind can be detected and judged by signs which are both visible and known. The uncharted ether, changing in density from moment to moment, affords no such reliable record, and its danger spots shift from hour to hour. Safety and danger zones change places without warning, nor can any effort of man insure the one or remove the other. It is a condition which everyone who mounts into the air must expect, even though he have no fear.

Aircraft have been greatly strengthened and given more and better power, but thus far no construction seems to be able to withstand the tremendous shock of a too-sudden and abrupt change in course. A steam locomotive turns turtle if hurled abruptly against a sufficient grade, even though the track lead in a perfectly straight line; and leaves the rails if driven at too high speed on to a sharp curve. Automatic safety devices have amounted to practically nothing in the aeroplane, and the truth is being brought home more forcibly each day that skill and experience are the safeguards on which the airman must rely. For this reason learners should be impressed with caution as the first cardinal principle, and teachers should not pass even a ready student until he has thoroughly qualified under all conditions possible to compass during instruction. On the other hand, each accident should point out a warning of how not to do the thing which failed, and the hundreds of enthusiastic beginners will do well to study what to avoid. The fliers will increase in numbers, but they owe it to the art they espouse not to indulge in reckless freak performances. Amateurs may well heed and follow the example of that father of flight, the late Wilbur Wright, whose motto was "Slow but Sure."

* * *

High Standard in Our Navy

THE transformation from the sail-propelled man-o'-war to the complicated mass of machinery known as the modern battleship is not one bit more pronounced than the improvement which has taken place in the personnel of the men who compose the human working parts of these great machines. Time was when the Navy was looked upon by many as a sort of reform school, a last resort to which young men could be sent who were not quite bad enough to put in jail and not good enough to roam at large. Such conditions have fortunately passed away and the American Navy today is composed of brains and muscle of the highest order and a personnel of which the country can well be proud. I was specially impressed with this fact when during the past season I spent some days in a well-known New England port which is seldom without one or more naval vessels during the summer. At this particular time there were four battleships and eight smaller fighting craft, with a total of over four thousand men on board. On two of the battleships the men had not set foot on land for six months—an unusually long time—and naturally were anxious to get ashore. When I saw the ships' steam launches towing the long lines of boats filled with a thousand men, with 24 hours' shore leave, "a hot time in the old town tonight" seemed to me inevitable. And there's where I guessed wrong. The young men were allowed the fullest liberty; they had plenty of money and were very live wires; and the saloons and places of amusement were making special efforts and working overtime to attract visitors.

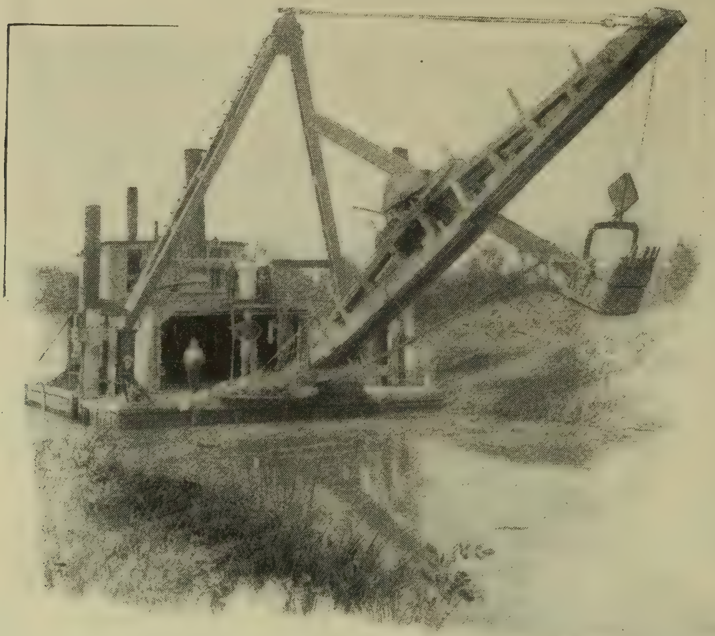
When the 24 hours expired and the launches came puffing into dock again, I watched the boys load into their respective ships' boats, and out of one thousand, two, just two boys, required assistance from their comrades. And the chief of police told me his men had not had occasion to arrest a single man. To me the high standard of conduct, the respect for the uniform, and respect for one's self, which is taught these young men, was a most impressive thing. Can you imagine 1,000 young men of equal age, landsmen, including clerks in banks, offices and stores, and skilled young men in all the various mechanical trades, going out on their first holiday in six months, with plenty of money to spend, and all restraint removed, and coming back at the end of 24 hours with only two men "disabled"?

The conduct of the boys of the Navy, ashore in their own land, with less necessity for constraint than in a foreign port, deserves the highest commendation, and better words of praise and congratulation than these few lines express.

H. H. WINDSOR

MARSH BECOMES PEPPERMINT AND BEET FARM

The story of Prairie Farm, located between the Flint and Shiawassee Rivers, near Saginaw, Mich., is of exceptional interest as showing what can be done by the employment of modern methods of reclamation, hand in hand with scientific management, to create a valuable property out of almost worthless land.



Digging Ditches and Building Dikes through the Great Marsh in Order to Obtain Drainage

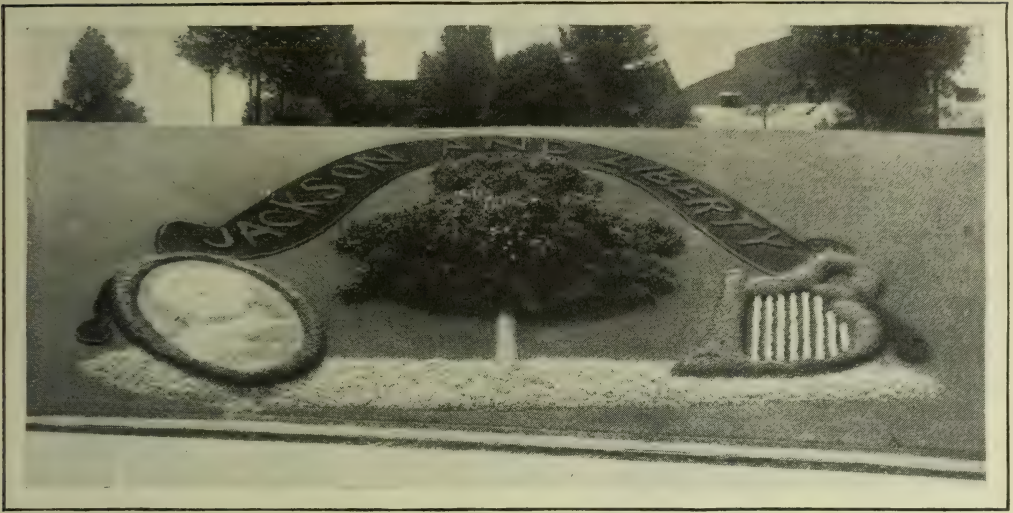
When, some nine years ago, this vast farm of 9,500 acres came into the possession of the present owners, it was practically all marsh and was largely covered by water. Immediately engineers prepared plans for the draining of the land and for its protection from floods. Three dredges were built, and 25 miles of dikes constructed, including a cross dike through the middle of the farm to protect the lower half. Ditches, 50 ft. wide, were excavated on each side of the dikes, and at the present time the works of reclamation and protection are completed.

A pumping station, equipped with three 250-hp. boilers, two 24-in. and four 12-in. centrifugal pumps, is located at the west side of the farm, at the middle dike, making it possible to pump out both sides in case of rains or floods; and a railroad has been built into the center of the farm to care for the numerous products.

As it now stands, it is a scientifically managed farm of the best modern type, with 4,000 acres actually under cultivation, to which it is planned to add 400 acres each year. There are 1,250 acres of peppermint, this crop being exploited in two distilleries for the manufacture of peppermint oil. Among the other crops sugar beets is the next in importance, but ample acreage is also given to the more ordinary farm products.

A small town with some 60 tenement houses for the farm

Beets Thrive on Hundreds of Acres of the Reclaimed Marsh



Floral Design in Baltimore, with Hickory Log and Hickory Cuttings Forming the Hickory Tree of the Democratic Emblem of 1828

help, of whom there are some 100 to 300, according to the season, and two large apartment or boarding houses has been built up, and the whole undertaking is proving most successful.

LEAD BEER-STEIN COVERS WORRY GERMANS

The question of how much lead may enter into the composition of covers for beer steins without endangering the health of beer drinkers has been a burning one in Germany lately. Some years ago a law was enacted making 10 per cent lead the maximum admixture, the remainder to be pure tin. This did not satisfy the manufacturers, who claimed that even a much higher percentage could not possibly be injurious. To throw light on this important question investigations have been carried on at the pharmacological institute of the Berlin University by Prof. A. Heffter and Dr. F. Sachs, and the results were recently published in the Quarterly Journal of Medical Jurisprudence and Hygiene. The conclusions of the learned investigators were to the effect that, so far as lead poisoning is concerned, the most capacious beer drinker has little or nothing to fear, and the beer-stein makers can now put 35 per cent lead in the covers.

POLITICAL EMBLEM IN FLORAL DESIGN

A unique floral design adorns the slope of the Mt. Royal Station of the B. & O. Railroad at Baltimore. This design is that of "Jackson and Liberty" such as was at the top of the Democratic voting ticket many years ago. The design was made by the public park commission of Baltimore and was inspired by the democratic national convention which was held in that city last June.

The design, which is 66 ft. in length and 54 ft. in width, contains 7,000 rhododendrons. The center of the design is a hickory tree, the trunk of which is a real hickory log, while the branches and leaves are hickory cuttings. In the lower left-hand corner an oil-painted picture of Jackson occupies a space of 18 by 10 ft. The design attracts a large number of visitors daily, and will remain on display until cold weather commences.

WATERPROOF SHOES

A shoe manufacturer in this country is putting a waterproof shoe on the market which is said to be radically different from other makes in that a new method of attaching upper and sole has been adopted. In this method the upper is turned over and sandwiched in between a thick inner sole, the under edge of which is channeled, the welt being held in place by staples, the points of which are bent over to prevent pulling out. The sole is then sewed to the welt.

French Military Airmen in an Aeroplane Dictating Information into a Phonograph and Dropping a Record

The general practice in shoe manufacture is to sew the uppers to a thin strip of leather, called the welt, and then sew or nail the sole to this welt.

PHONOGRAPH MESSAGES FROM AEROPLANES

A novel and in many ways a most interesting effort to communicate information from a military aeroplane to officers on the ground has met with marked success in the course of recent experiments in France. The new scheme involves the use of specially built phonographs, one on the machine and one at each headquarters which it may be desirable to have receive the messages. Then in the course of the aerial scouting trip, the observer, or even the pilot himself, dictates into the machine such information as may be considered interesting or valuable. Disk records, of a material soft enough to receive the impression of the recording stylus, but less breakable than ordinary wax records, are used, and by the expedient of having a special feed on the traverse screw of the graphophone, it is not possible to reproduce the records except on similar special machines. As each record is completed it is placed in a novel protecting case and dropped into the camp where men are waiting to receive it. To avoid the necessity for a low descent of the machine as a preliminary to dropping the record, the use of small parachutes has been suggested. These, while they would land the records lightly from great heights, are open to the objection that they might let the messages drift into hostile hands.

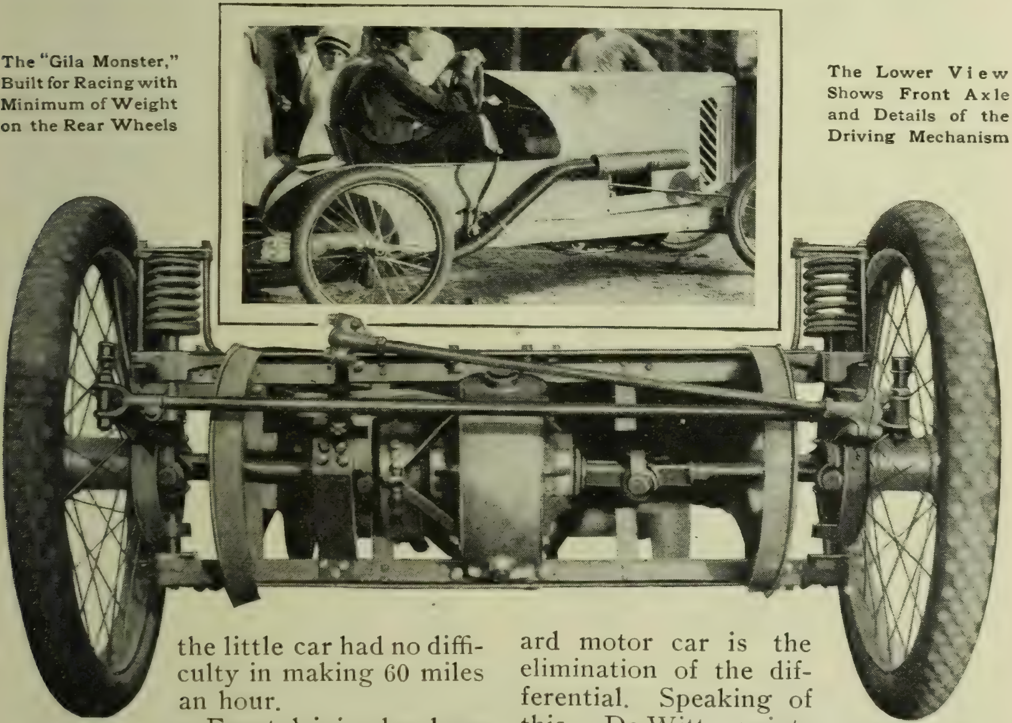
Officers Listening to a Record Dropped from an Aeroplane

STANDPIPE GASOLINE GAUGE

An ingenious gasoline gauge is being placed on the market by an American automobile-accessory concern. It comprises a cylindrical standpipe which is inserted into the gasoline tank of the automobile and soldered in place, and which contains a center staff revolved by a sliding float. The revolutions are controlled by an arm which engages a spiral slot, running from top to bottom of the standpipe, at the upper end of which is a circular dial. A hand, mounted on the upper projecting end of the center staff, registers the height of the float on the circular dial, the slot being so cut that the hand has a sweep of 180 degrees. A glance at the dial, therefore, is all that is necessary to show how much gasoline there is in the tank.

NEW RACING CAR WITH FRONT DRIVE

A unique car for racing is being built by George DeWitt. The "Gila Monster," as he calls it,—and the name is not inappropriate—is one of the most novel machines that has been brought before the American public in recent years. It is front-drive, front-steer, weighs 600 lb., and is intended to develop, when further adjustments have been made, a speed of close to 90 miles an hour. In the tests through which it was put shortly after its completion the little car had no difficulty in making 60 miles an hour.



The "Gila Monster," Built for Racing with Minimum of Weight on the Rear Wheels

The Lower View Shows Front Axle and Details of the Driving Mechanism

Front driving has long been a pet theory of racing men. They hold almost unanimously that the ideal car is one which is built on the same principle as the spear: all the weight in front. It is their contention that a car which applies all its power at the rear of a bulky body is always in danger at a curve: The rear wheels, with the traction and the power, tend to fly off the curve at a tangent. They are pulled out of their course by the steering gear, and a skid or a spill is the logical result.

The "Gila Monster" is a miniature automobile. It is equipped with a four-cylinder 35-hp. engine; multiple-disk clutch; selective transmission, and a set of very effective brakes. The balance is like that of a monoplane. The gasoline tank is under a long cigar-shaped hood over the engine. When in operation the rear wheels scarcely touch the ground.

One point in which the "Gila Monster" differs radically from the standard motor car is the elimination of the differential. Speaking of this, De Witt points out that no manufacturer has ever found it necessary to incorporate a compensating device in the front axle, and with the front-drive car the traction of the rear wheels is so slight that there will be little road friction when rounding a curve. He asserts that the weight caused by the addition of a differential would cause more tire wear than would friction in its absence.

The brake drum is set in a place that would seem peculiar on a car of another sort. It is fixed in the front axle about 6 in. from the drive shaft. Two sets of universal joints in the front axle insure the flexibility made doubly necessary by the absence of the differential.

Weight has been cut wherever possible. The framework is of hickory, reinforced with steel. Even the brake and clutch pedals have been put through the weight-reducing process until they resemble sieves. The drill has been called into requisition upon every ounce of superfluous metal.

SHELLING ICEBERGS IS UNPROFITABLE

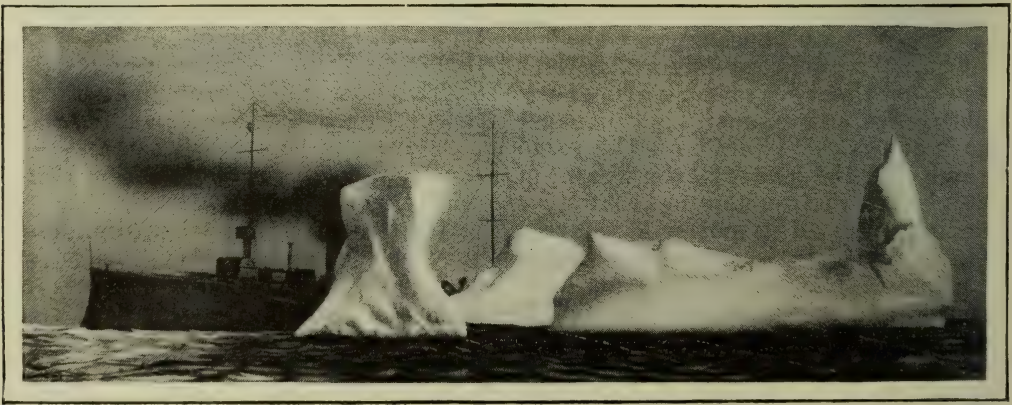
The scheme suggested following the loss of the White Star liner "Titanic" that icebergs might be destroyed by shells from the guns of naval vessels has been tried and found impracticable, as was predicted in these pages. Experiments made early by the United States scout cruiser "Birmingham" demonstrated that there is no hope of eliminating icebergs as menaces to navigation by such means.

The "Birmingham" spent most of one day in July in firing shells from her 5-in. guns at the huge berg shown in the accompanying photograph. At the conclusion of the firing, little damage had been done to the berg, except to break off chips and smash projecting points into splinters. The shells failed to penetrate the ice to any considerable distance, nor did they produce any great cracks or rents. They simply raised showers of splinters, and that was all.

The naval officers had little expectation that the results of the experiment would be different from what actually occurred. The impenetrability of water, both in liquid and solid form, was too well known to them to admit of much faith in the scheme. The idea was one of a myriad suggested in all seriousness after the sinking of the "Titanic." Furthermore, as naval officers pointed out, so great a portion of an iceberg is submerged, that to blow off the top of one by gunfire would simply result in raising above the water part of the submerged portion of the berg, so that the smashing process, even if effective, would have to be continued almost indefinitely.

The "Birmingham" made these experiments just before being recalled from her patrol of the navigation routes, which was begun last May for the purpose of giving wireless warnings to navigation of ice in the paths of the liners. The patrol was abandoned because of the decrease in the amount of ice in the navigation routes, owing to continued warm weather.

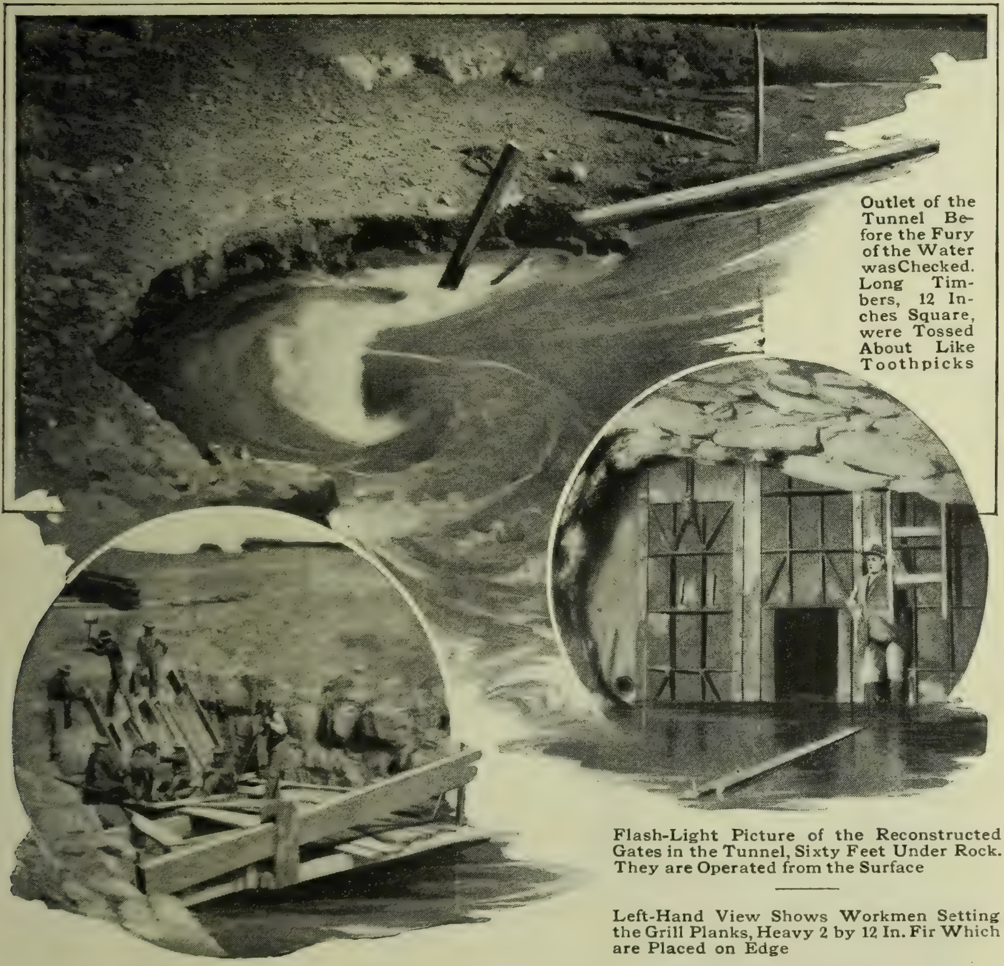
¶At least a part of the French prize for "aviettes" was won in Paris, July 4, by one rider who succeeded in making his man-power machine cover distances of 11.7 ft. and 10.8 ft. respectively with and against the wind.



Scout Cruiser "Birmingham" near Icebergs Which were Shelled without Material Shattering

THE HURRY CALL, "GATES GONE OUT!"

A hurry call came into Salt Lake City. "Tunnel gates gone out. Send help at once." Forty minutes later two engineers were on a Rio Grande engine bound for the Sevier River, for it was that river which was out of control, and threatening ruin to the great Pahvant Valley.



Outlet of the Tunnel Before the Fury of the Water was Checked. Long Timbers, 12 Inches Square, were Tossed About Like Toothpicks

Flash-Light Picture of the Reconstructed Gates in the Tunnel, Sixty Feet Under Rock. They are Operated from the Surface

Left-Hand View Shows Workmen Setting the Grill Planks, Heavy 2 by 12 In. Fir Which are Placed on Edge

The river had been dammed for irrigation purposes. The reservoir dam is of fair size, even in the heart of great water projects, for it is 900 ft. long and 66 ft. high. The reservoir has a storage capacity of 3,000 acres of water, 30 ft. deep; sufficient to irrigate 75,000 acres of arid land.

The reservoir outlet is a tunnel through solid rock adjoining the dam. It is 400 ft. long, 14 ft. wide and 10 ft. high. In the center of it are the controlling gates, mechanically operated from the surface, 60 ft. above; and the destruction of these gates by the enormously swollen flood in the spring paralyzed all control of the water, threatening the waste of every gallon, and the loss of all crops for that season on the immense irrigated tract. Hence, the urgent call for help.

Before the engineers arrived, over 400 wool and grain sacks were filled with earth and dumped into the tunnel inlet; but although some of the sacks weighed half a ton, they were instantly swept down through the tunnel. Great timbers, 12 in. square, were placed in a slanting position from the irregular edge of the tunnel opening, but broke like pipestems.

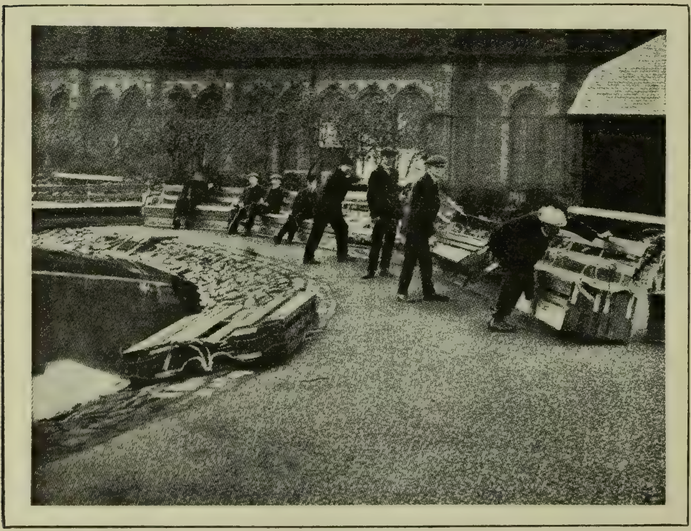
Within 30 minutes after the engineers sprang from their train, a telegram was in Salt Lake City calling for a car of cement by special train; and a crew of men were hewing pockets in the rock walls of the tunnel entrance, to take the ends of the great concrete beam which the engineers had almost instantly decided upon. This beam was to be 22 ft. long and in cross section 3 ft. 6 in. each way, with a 60-deg. slope on its outer face. Its position was to be just at the then level of the water, and timber forms for it were made ready to be slung across, the moment the side pockets were hewn out, and the cement arrived.

The great concrete beam was cast as quickly as brawny arms could throw the bags of cement from the car, and mix the concrete. After it was cast, the party had to sit by and watch the rush of water through the tunnel for three days while the beam hardened.

Then they put in the "grill." It was of 2 by 12-in. fir, set edge-wise against the sloping face of the beam, so that only the 2-in. edge was exposed to the pressure. The lower ends lodged against the rocky bed of the reservoir; the upper ends against the concrete beam. This reduced the leakage so that men, who cared nothing for working in water up to their hips, could commence on the reconstruction of the new and stronger tunnel gates. Before the permanent gates were installed the reservoir was full, an overflow running through the waste sluice. The 75,000 acres of unparalleled fertile land was saved.

SEATS THAT BECOME LIFE RAFTS

Buoyant deck seats which are easily convertible into rafts of a seaworthy character are being installed on a transatlantic line of steamers. These convertible seats are made by an English firm. To quickly convert the seat into a raft the person sitting upon it has but to raise the front portion until it is level with the bottom of the seat. At this point it automatically locks itself and is ready to be floated either side up. Each seat is fastened to the deck by hooks and light lashings. The hooks are loosened and the lashings undone by the raising of the front of the seat.



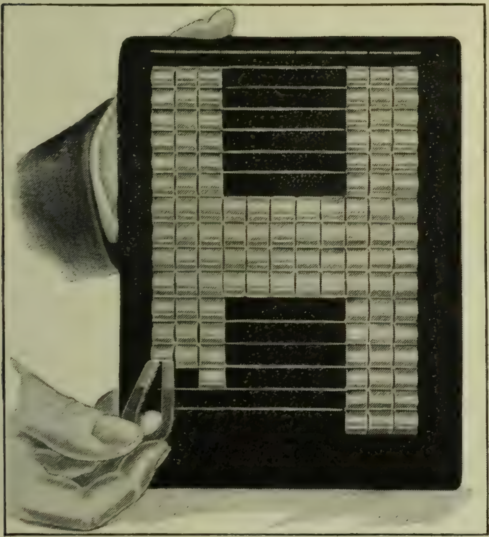
Seats Convertible into Rafts, Each Having Room for Carrying Six People Safely

Each of the benches is 9 ft. long and is supported on four separate metal air tanks. When it is converted into a raft it is capable of bearing the weight of half a dozen people. Should no one happen to be using the seat when the boat sinks, the rising water on the deck would lift it, unfasten the hooks and lashings, and let it float off free so that any swimmer might make use of it. The picture shows a consignment of the seats being tested at the factory preparatory to being shipped to the steamship company.

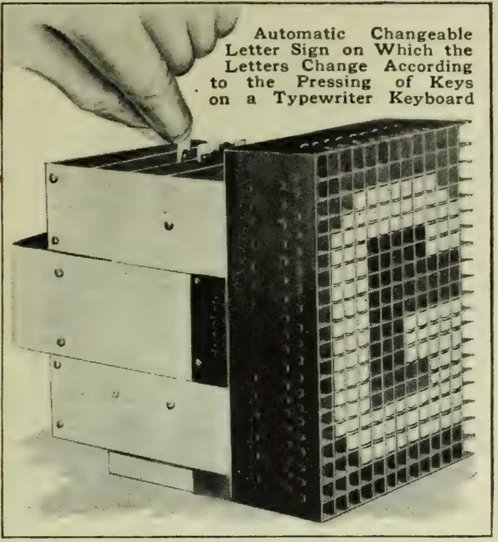
TYPEWRITER KEYBOARD OPERATES SIGN

A new idea in changeable letter signs, with uses varying from kindergarten lessons to big advertising signs, is just going on the market. An oblong metal sheet is pierced with slits at regular intervals, and in each slit a curved strip of thin steel is fixed so it will slide out on either side of the sheet. By sliding out these little strips on the face side, any letter can be formed. The sliding out of the strips is easily performed with a small magnet, this feature making the apparatus an interesting device for kindergarten work.

For commercial use, such as for advertising signs, or for use as a railroad-station signboard or a carriage call board, an apparatus has been devised for the rapid formation of letters automatically, the letters appearing on the signs in accordance with the tapping of keys on a typewriter keyboard. Striking a letter key on the keyboard perforates a strip of paper with certain slits, somewhat after the manner of a piano-player roll, and the strip of paper then passes along to a contactor, an instrument which allows electrical impulses to pass through the perforated places, and thus set up a magnetic action which causes the proper strips to slide out on the face of the sign, forming the desired letters.



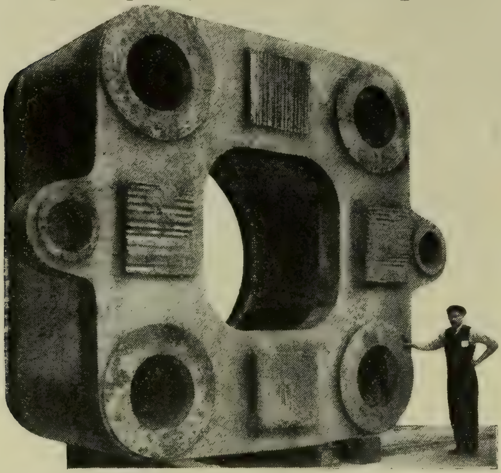
Forming the Letter H on the New Changeable Letter Device by Drawing Out Steel Strips with a Magnet through Slits to the Face of the Sign



Automatic Changeable Letter Sign on Which the Letters Change According to the Pressing of Keys on a Typewriter Keyboard

GIGANTIC HIGH-SPEED FORGING PRESS

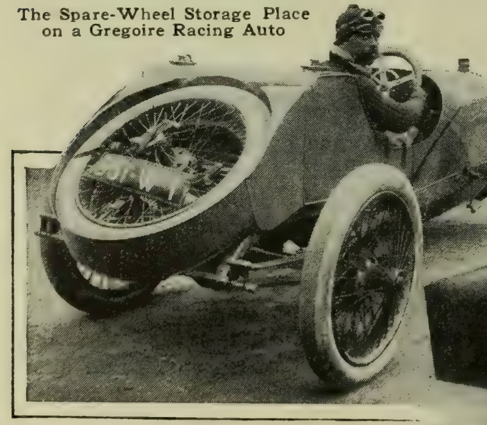
An immense casting has been made at South Bethlehem, Pa., to be used as a cap for a 10,000-ton high-speed forging press. Although nominally of only 10,000 tons' capacity, this press is estimated to be of sufficient strength to receive strains up to 20,000 tons. The development of this press has taken the greater part of a year. The speed demanded was enormous for such a mass, and an idea of the conditions to be met in its construction may be conceived from the fact that it involved the designing and making of a valve, no less than 18 in. in diameter, and capable of withstanding a pressure of 12,000 lb. per sq. in., without leaking more than a drop a second; which means practically a perfect valve. The speed requirements were such that in an hour the press will produce 60 car wheels. Even greater efficiency is expected, however, after the double crew, that will operate the press, has been trained in its handling. In spite of its gigantic mass, the controlling mechanism of the machine is so delicate, that a small boy on the pulpit can manipulate it by means of the operating valves, exerting sufficient strength to lift an ocean liner if it could be properly balanced.

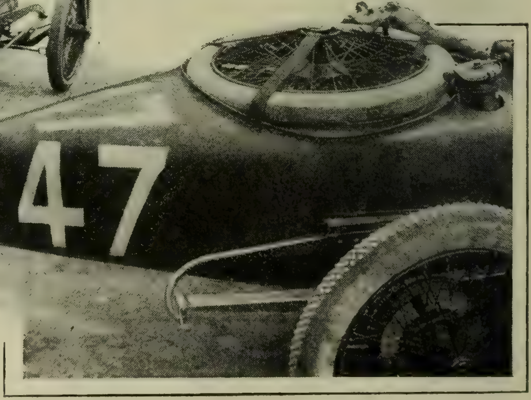

Casting for Cap of 10,000-Ton Forging Press Powerful Enough to Lift an Ocean Liner

The casting for the press shown in the accompanying illustration is only one of the many castings and forgings requiring for their transportation a special car, built for the purpose. The columns of this press are 30 in. in diameter and hollow-forged of fluid-compressed steel, while those of similar presses, previously ranking as the largest of their kind, were 28 in. and 26 in., respectively. The cylinder is 72 in. in diameter and said to be the largest copper-lined cylinder in the world. The two former presses referred to are of greater capacity, but the parts are not of such enormous size.

STORING SPARE WHEELS ON RACING AUTOMOBILES

The storage of extra wheels, a problem even on the ordinary touring car, is, of course, still more difficult of solution when the automobile in question is a racing car, for the storage must be so arranged as to keep the wind resistance at a minimum. During the recent "Grand Prix" of the French Automobile Club several new ideas in storage places drew attention, two of which are shown in the accompanying illustrations.


The Spare-Wheel Storage Place on a Gregoire Racing Auto



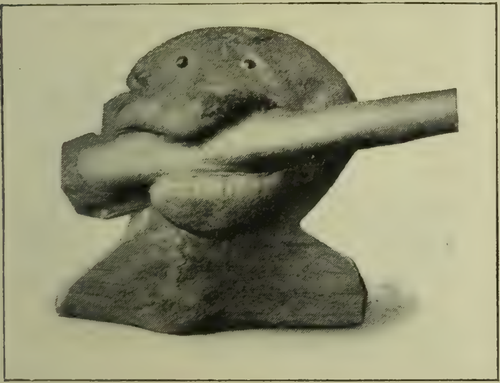
A Lion-Peugeot Racing Automobile, Showing Storage Place for Spare Wheel

HOSPITAL PATIENTS GO ON STRIKE

A dispute between a number of patients in the tuberculosis sanatorium at Beelitz, Germany, was the cause of a strike by a majority of the inmates who refused to take medicines or food until certain restrictions imposed by the director had been removed. The ringleaders of the protest marched about the grounds and endeavored to gain "sympathetic" support from the patients in all the other wards. Action first was taken by men patients, but later they were joined by the women who also refused both medicines and food. The "strike" lasted about 10 hours, after which some modification of certain new rules induced the strikers to resume their normal routine. So far as known, this is the first case of a strike in a hospital, but similar disturbances have taken place in jails.

"FREAK" KNOT SUGGESTIVE OF ANIMAL

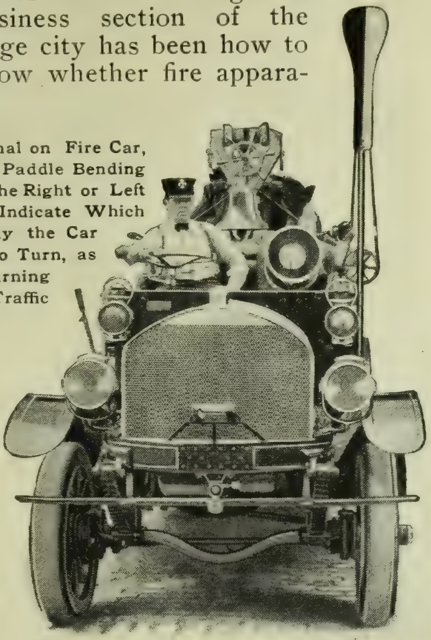
While a street in Seattle, Wash., was being cleared, a maple tree was found bearing the curious knot shown in the accompanying illustration. The only man-made addition to the "freak" is the eyes, which rendered nature's work so complete as to make the whole suggestive of a ferocious animal chewing a bone.



"Freak" Maple Knot Gives Appearance of Animal Biting a Bone

FIRE APPARATUS CARRIES WARNING TO TRAFFIC

Ever since the adoption of the silent fire-alarm system, the problem that has confronted the members of the traffic squad in the congested business section of the large city has been how to know whether fire apparatus responding to a call will go straight ahead or will turn into any particular street. Under the circumstances every traffic man not only has to clear a right of way along the street the fire apparatus is coming, but also has to prepare the way up and down the intersecting street in anticipation of a turnout, even though the latter may not be needed.



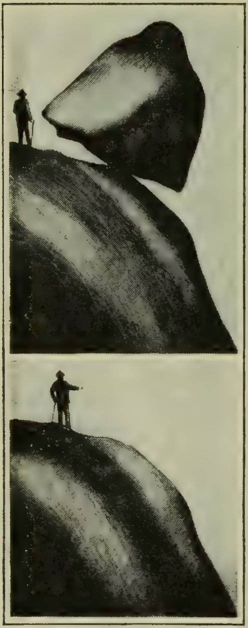
Signal on Fire Car, the Paddle Bending to the Right or Left to Indicate Which Way the Car is to Turn, as Warning to Traffic

With the introduction of the high-powered automobile service in Baltimore, with its great increase of speed over the horse-drawn vehicles, one of the members of the fire department invented the signal apparatus which is shown on this page. This signal is a simple affair, consisting of a large red-and-white-colored paddle, and is operated with a wheel and chain gear by the man who rides beside the driver and who also has charge of ringing the warning gong.

If the machine is going straight

ahead, the paddle is maintained upright, as shown in the picture. If it is proposed to turn out at a certain street intersection, the paddle is dropped to the left or right, as the case may be, just as soon as the machine reaches the other end of that particular block. As the paddle is high and can be seen two or three blocks away, the traffic policeman has ample opportunity to clear the way. The signal apparatus has been in use in Baltimore some months and while it is the only system of its kind, it has already proven its value and will be attached to all the fire-department apparatus.

FAMOUS BALANCED ROCK TUMBLES



The famous balanced rock which has been one of the natural curiosities of the province of Buenos Aires, Argentina, since time immemorial, lost its balance the early part of this year, rolled down the steep incline of the mountain, and was crushed at its base.

The rock measured 16 ft. in diameter and was about 13 ft. high, weighing about 300 tons. It was so nicely balanced that it swayed in the wind. Its loss of equilibrium is variously ascribed to natural causes and to the tourists' custom of throwing empty bottles between the rock and its supporting cliff, to see them crushed by the rock's swaying. This bottle-crushing procedure is claimed to have caused abrasion of both the rock and cliff.

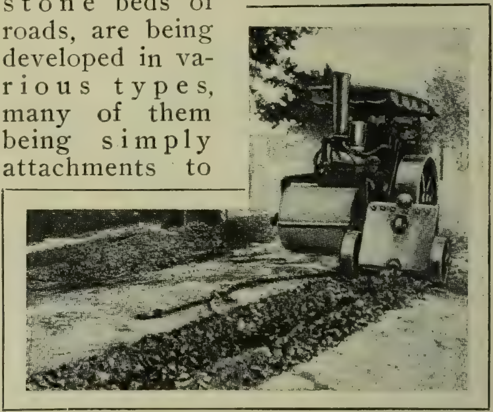
ℂDrs. W. and J. Meyer, who invented the apparatus for readily performing operations on the chest, described in a recent issue of this magazine, have dedicated their patent to the use of the general public.

WATCH FOR FOREST FIRES FROM TOWER

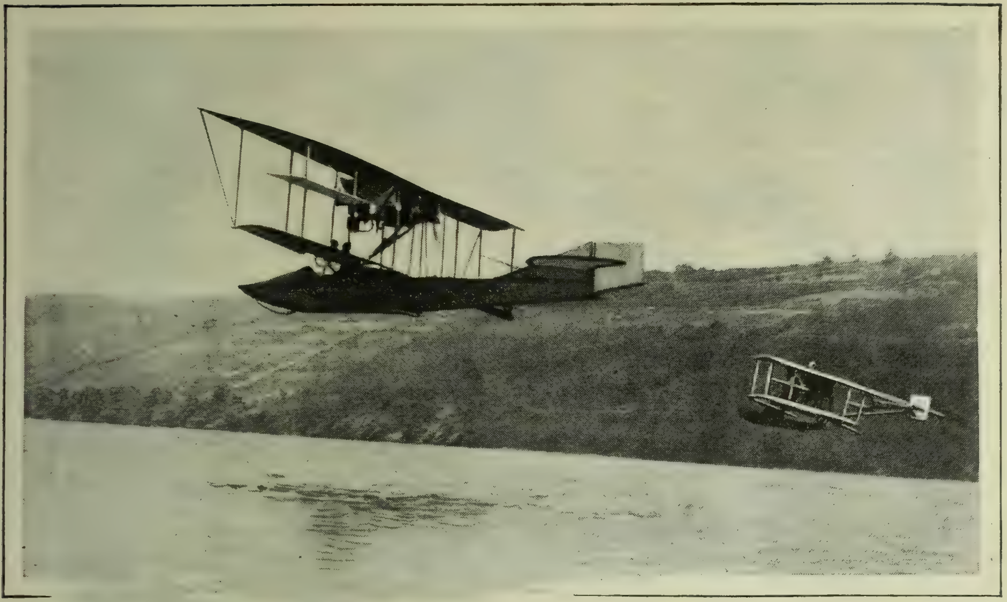
The cities and towns of Reading, Wakefield, Melrose, Stoneham, and Saugus, along with other communities of Massachusetts, within a 15-mile radius of Bear Hill, are to be protected from danger of forest fires by the erection of a fire watch tower upon this hill. The tower, which will be of steel, and will rise to a height of about 50 ft. above the crest of the hill, will be connected with the fire stations by telephone. The watchmen stationed in the tower will be provided with powerful field glasses.

NEW TYPE OF MACHINE TO TEAR UP OLD ROAD

Road-making machines, called scarifiers, which will first tear up the old stone beds of roads, are being developed in various types, many of them being simply attachments to road rollers. The accompanying illustration shows one which is operated as a side car to a road roller.



Novel Type of Machine Attached to Road Roller, to Tear Up Old Roadbed Preliminary to Resurfacing



The "Flying-Boat" Sailing above Lake Keuka, Hammondsport, N. Y.

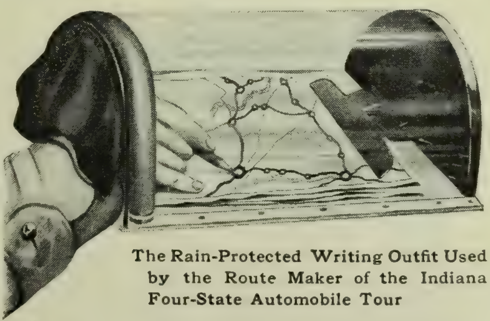
NEWEST HYDRO-AEROPLANE IS A FLYING-BOAT

The latest Curtiss hydro-aeroplane, shown flying above Lake Keuka at Hammondsport, N. Y., deserves the title of "flying-boat" more than any type of aerial machine. Instead of being supplied with the ordinary pontoon, this machine is practically a speed motorboat provided with planes. The boat, which has a spray hood to protect pilot and passengers from water, and in which the engine itself is located, is attached directly to the lower plane instead of hanging some distance beneath it, as in the ordinary hydro-aeroplane. There is no front elevating plane, and the rudder and rear elevating planes are parts of the stern of the boat.

The boat is 26 ft. long, and has a width of 3 ft. with a depth of hull amidship about equal to the width. The planes are 5½ ft. deep and about 30 ft. wide. The pilot and passengers sit well down in the hull. The boat itself is so strongly built that it can be beached with safety even through a surf, and is capable of being handled as a fisherman handles his dory, or anchored to a buoy like a yacht.

WATERPROOF WRITING CASE OF A PATHFINDER

The official pathfinder for the 1,225-mile four-state tour of the Indiana Automobile Association used a special waterproof writing contrivance in making his notations and compiling the route. This consists of a steel writing file with spring clip, covered



The Rain-Protected Writing Outfit Used by the Route Maker of the Indiana Four-State Automobile Tour with celluloid. One end is of sheet metal and the other end, through which the hand and wrist is thrust to write, has an adjustable waterproof curtain.

With almost continuous rains during his trip, the route maker was able at all times to keep the manuscript dry and preserve the route.

MOLD FOR CONCRETE PILES CAN BE UNROLLED

At the Pearl Harbor naval base in Hawaii the government is putting in place a number of concrete piles which are molded quickly and cheaply in a rather unusual manner in an eight-sided mold so hinged as to unroll after each pile is cast. The piles are said to be exceptionally strong.

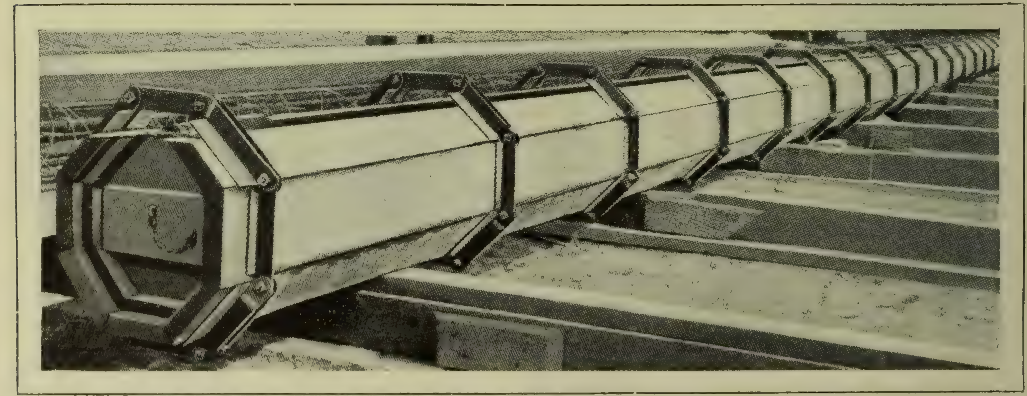
The reinforcement of the pile consists of longitudinal rods and any desired number of wire hoops through which the longitudinal rods are run. The pile is an eight-sided affair and there are, of course, eight rods running the full length, and one in the center which is sometimes hollow for jetting purposes. Besides the center loop the hoops have eight peripheral loops, all made by winding wire around a pegged table top. After the rods are run through the loops on the wire hoops, the entire reinforcement is carried to the mold and laid in place.

At that time the eight sides of the mold are extended and lie flat on the skids. When the reinforcement is ready, seven of these sides are brought into place, the ends inserted, and the reinforcement centered by hanging it with wires. The relative position of the sides of the mold is always the same, as they are bound together by eight links of an endless chain. The eighth side of the mold is left off for pouring purposes.

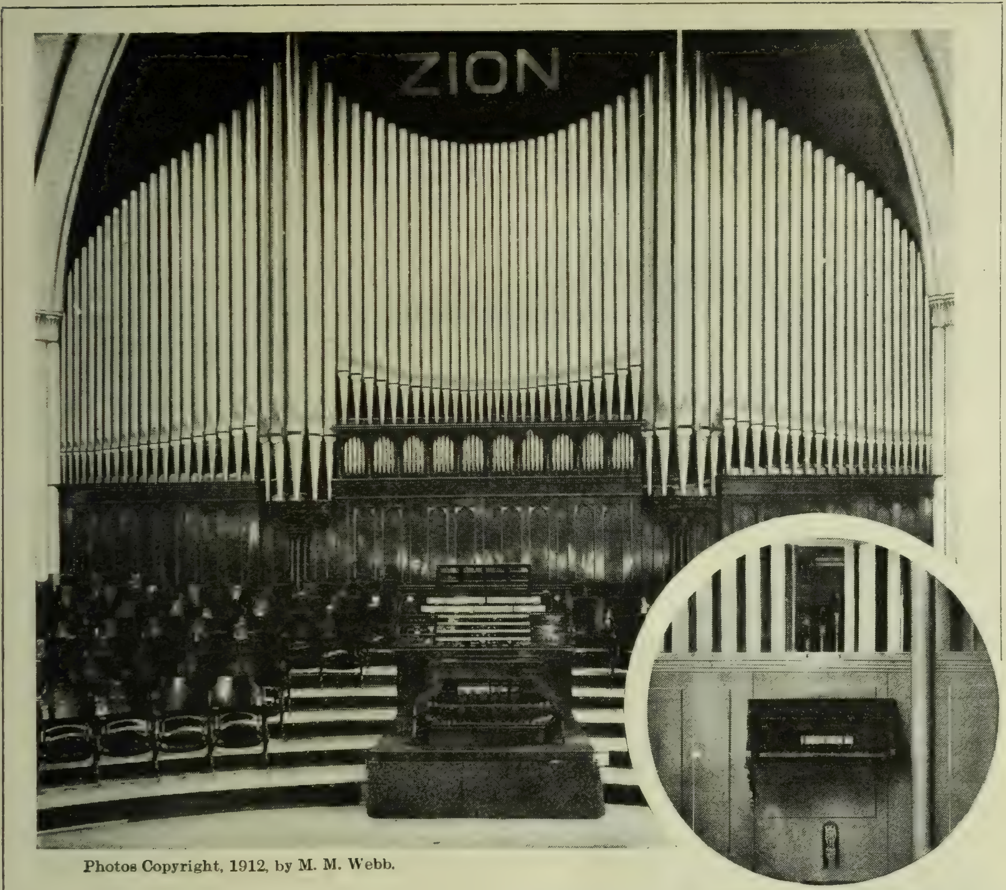
When the pouring is completed the top side of the concrete is straight-edged. The pile is allowed to set for 24 to 48 hours and then the mold and all is rolled over until the exposed side of the pile is the base and rests on the skids. The bolts in the link, now on the bottom, are removed, and the whole mold is flattened out and taken away to be used for another pile.

After curing on the skids for 30 days these piles will withstand the roughest kind of treatment, it is said, and have records of being driven through boulders without splitting at the end. The molds, which are generally made of wood, deteriorate very slowly and if the inside surface is oiled before use, they require practically no repairs and will last almost indefinitely.

¶While the American ocean resorts may boast of big business during the heated term, they still have much further to go before they will equal in popularity the holy city of Allahabad, India, where in one week more than 2,000,000 people bathed in the waters of the Ganges and Jumna which meet at that place.



Concrete-Pile Mold of Eight Sides So Hinged That It can be Unrolled after Use



Photos Copyright, 1912, by M. M. Webb.

Main Console and Great Organ at Zion City Tabernacle

Echo Organ at Zion City Tabernacle Prayer Room

ORGAN PLAYS IN THREE PLACES AT ONCE

An American firm of organ builders has recently completed, in Zion City, Ill., a pipe organ which is even larger than the famous one in the Salt Lake City tabernacle, and which possesses many new features in its construction. This giant musical instrument is really three distinct organs controlled, if desired, from the main console or keyboard. Two hundred feet from the choir organ, in the gallery at the entrance, is an echo organ operated from the main keyboard during processionals. The second echo organ, in the prayer room at the other end of the tabernacle, can be played independently of the great organ or by the organist at the main console. The organist can also sit at the prayer-room organ and operate the main organ.

The main console possesses many unusual features. It is mounted to revolve so that the organist may face in any direction. The organist's work is further simplified by the adjustable visible combination tablets on the console. These enable him to produce an effect quickly without having to pull a dozen or more stops. Another new feature is the coupling of the entire pedal organ with the great organ.

A wonderful echo effect has been produced by the location of the "vox humana" in the prayer-room echo organ. When this repeats the melody on the "vox humana" of the great organ there is a startling resemblance to a singer's voice, softened by distance. Still another innovation is the set of chimes built into the gallery echo organ, which are used as responses to the melodies of the great organ 200 ft. away.

Some idea of the size of the giant organ may be obtained from these figures: There are 5,055 speaking pipes; the largest is 22 ft. long and the smallest measures but five-eighths of an inch. The instrument contains 1,500 more pipes than the famous organ at Salt Lake City. The main console has four manuals, 70 stops, 52 couplers, 54 combination pistons, nine combination pedals, five swell pedals and one crescendo. And in addition to this the prayer-room echo organ has a keyboard of its own.

Electricity is, of course, the motive power. More than 1,300 miles of wire have been used in the cables and on the magnets. It requires a 10-hp. blower, forcing air through an 18-in. pipe, to keep the bellows of the organ filled. The organ is 40 ft. wide across the front, 20 ft. deep, and 30 ft. high.

MOTOR CAR WHICH CAN RUN UNDER WATER

An English automobile manufacturer who caters especially to colonial trade, has taken into consideration the danger of floods in the operation of motor cars and in order to meet such unusual conditions, he builds his cars with watertight magnetos and carburetors. Before sending out cars he tests them under water, as shown in the accompanying illustration. The vertical pipe at the rear of the car shows that the engine was running during submergence, while the pipe projecting upward from the radiator, it is assumed, supplies air to the carburetor.

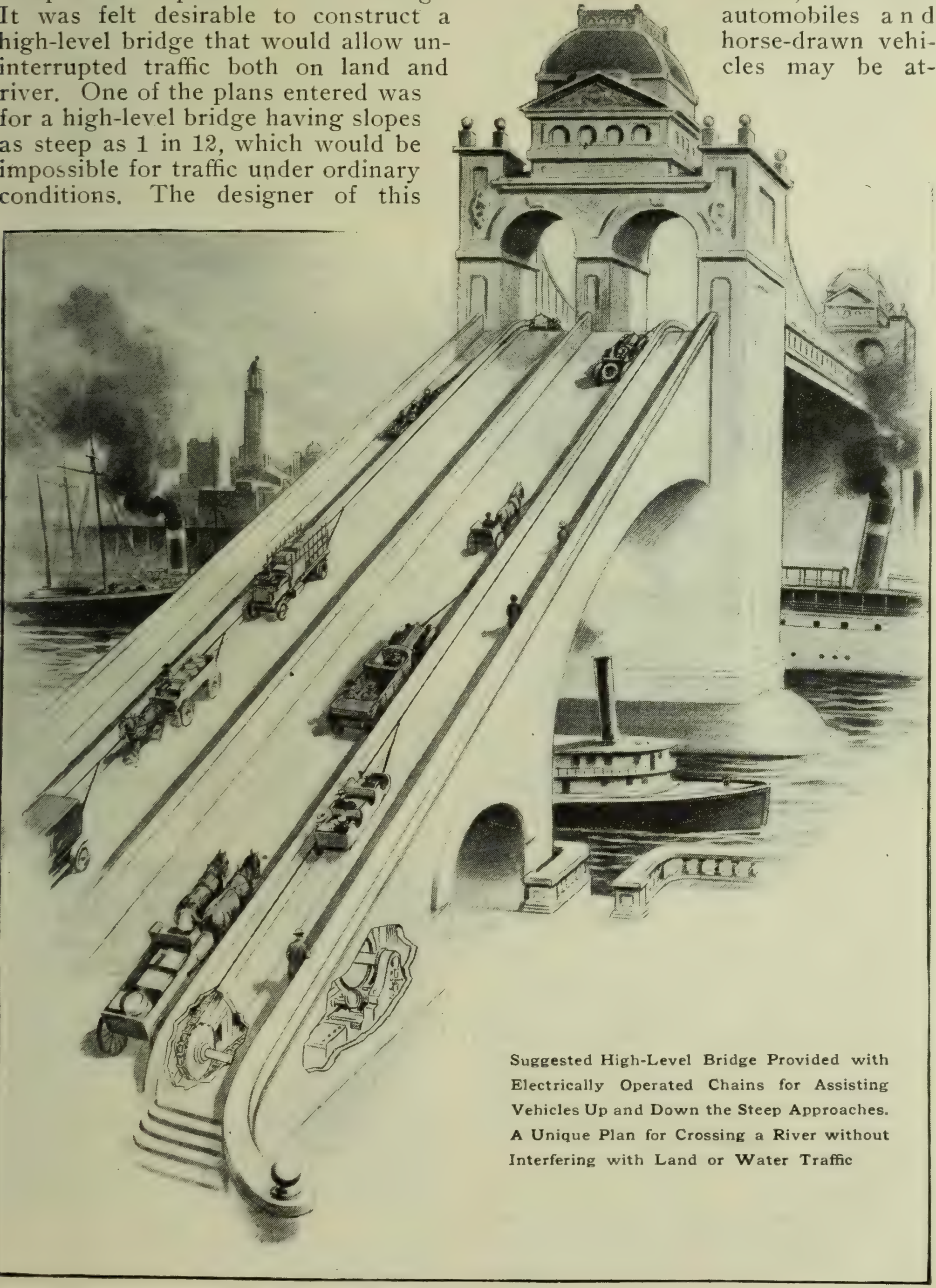
Motor Car Running under Water, the Smoke from the Exhaust Proving the Engine to be Operating

WEEKLY FLYING IN EUROPE TOTALS 80,000 MILES

Flight progress in certain European countries has gone so far that it is fast developing from the sensational into the commonplace. In the place of the occasional exhibition flights that the newspaper men once were quick to cable columns about to the ends of the earth; the most astounding cross-country journeys are now become humdrum, being disregarded altogether by the representatives of the daily press, and minimized to the briefest items even in the aviation magazines. For example, a perusal of a few issues of the foreign aviation weeklies reveals column after column of paragraphic comment, which five years ago could have been created only by the imagination of a Jules Verne, or discovered in a copy of a newspaper from Mars. "On the 24th ult., Lieut. Pierra on a Farman biplane left Rheims, and later arrived at Dunquerque, having flown 220 miles, with two landings en route"; "On Monday, Compte d'Hespel left Brussels and reached Ostend in 54 minutes, a distance of 77 miles, accomplished at 91 miles per hour," etc.; to a total that is now estimated to exceed 80,000 miles a week. Moreover, the fatalities now attending this flying hardly exceed one death for each 100,000 miles against one for each 1,000 miles only three years ago.

ELECTRIC AID IN CLIMBING BRIDGE APPROACHES

A novel scheme was recently exhibited at Cologne, Germany, in a competition of plans for a new bridge. It was felt desirable to construct a high-level bridge that would allow uninterrupted traffic both on land and river. One of the plans entered was for a high-level bridge having slopes as steep as 1 in 12, which would be impossible for traffic under ordinary conditions. The designer of this bridge, however, plans to equip the approaches with electrically driven chains, to which automobiles and horse-drawn vehicles may be at-


Suggested High-Level Bridge Provided with Electrically Operated Chains for Assisting Vehicles Up and Down the Steep Approaches. A Unique Plan for Crossing a River without Interfering with Land or Water Traffic

tached for haulage up the approaches and "easage" down the approaches. Little cars drawn by these chains are also provided for pedestrians.

NOISELESS GUN FOR KILLING HORSES

A curious horse-killing gun used in England to kill horses which have been injured, is now being adopted by American anti-cruelty societies because of its noiselessness and surety of action. By a slight blow given in the manner shown in the illustration a bullet is noiselessly driven into the brain of the animal, killing it instantly, without a sound to attract attention in a city street.

A Horse-Killing Gun, Discharged by Striking a Slight Blow with a Mallet, Which Kills Instantly and Noiselessly

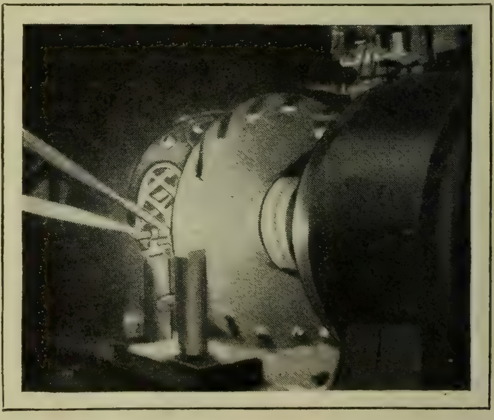
GRADING HEADLIGHTS BY PHOTOGRAPHY

The camera as an aid in choosing fittings for motor cars has been called into successful use at an auto plant at Buffalo. It was necessary to make a choice between several kinds of headlamps, and road tests at night were not considered infallible in result, because of the possibility of differing weather conditions. So the camera was called upon.

On the night of the camera test a large screen was placed against a blank wall and the car from which the test was made was stationed some little distance away, facing the screen. The camera was placed in a fixed position. As each set of headlights was fixed to the supports on the car and the lights switched on, two photographs were made: One of the screen alone, to show the projection of the lamps' rays, and the other of the ground between the lamp and the screen, to illustrate the diffusion. All the exposures were made under exactly the same conditions, the plates were all well developed together and the prints made together. In this manner the photographic prints gave an accurate idea of the comparative lighting power of the various lamps tried out.

SHADOW ILLUSION OF A WIRELESS APPARATUS

Although moving at the rate of 1,800 revolutions a minute, the studs on the outer edge of a disk in a wireless-telegraph apparatus cast steady shadows that seem to be standing still, and that show clear and distinct in a time-exposure photograph, as was the original of the accompanying illustration, taken in the wireless station on the roof of a Philadelphia store. The apparent conflict with natural laws is, of course, due to the fact that the spark which casts the shadows is not continuous, but only flashes as each one of these studs passes a certain fixed point. Thus the shadows of the studs appear



Illusion of Steady Shadows Cast by Studs on a Disk Revolving at the Rate of 1,800 Times a Minute, the Photograph Being a Time Exposure always in the same place, and cannot appear elsewhere. As a matter of fact, each of the shadows shown in this time-exposure picture and each of the studs shown, are not really separate studs with their shadows, but each is a composite photograph of all the studs and their shadows which in turn appeared at that point during the exceedingly small fraction of a second that the spark flashed.

THE ANTIQUITY OF MAN IN PERU

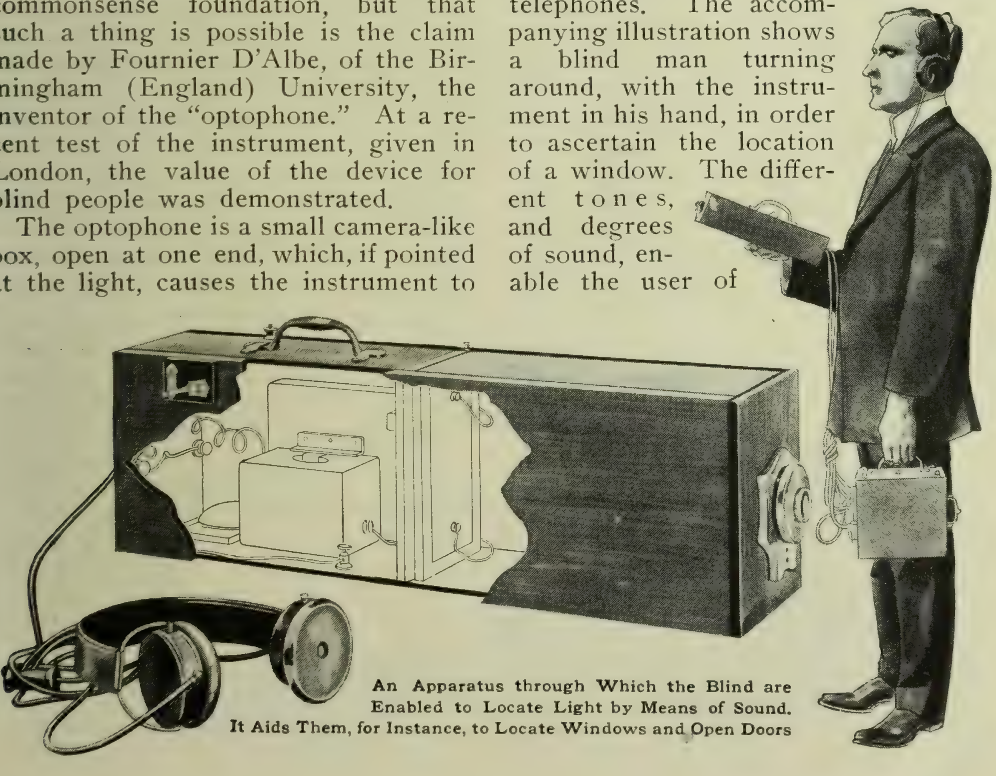
The Yale Peruvian expedition, organized under the auspices of Yale University and the National Geographic Society, sailed recently for Peru to continue the work of the expedition of 1911, in which Professor Hiram Bingham, head of both expeditions, discovered the remains of men believed by him and other authorities to be between 22,000 and 50,000 years old.

The expedition expects to make a careful survey of the Cuzco basin and its vicinity, with special reference to the age of the gravel deposits where human and other remains were found. This basin is in the Vilcabamba Valley in which eight Inca and pre-Inca cities and temples once stood, and which still remain in part. The discovery of the bones of human beings who lived more than 20,000 years ago, say 20,000, as an exceptionally conservative estimate, is the first authentic physical record of prehistoric man's existence in the western world.

THE BLIND MAY NOW "HEAR" LIGHT

Hearing the "sound" of moonlight appears a fantastic notion without commonsense foundation, but that such a thing is possible is the claim made by Fournier D'Albe, of the Birmingham (England) University, the inventor of the "optophone." At a recent test of the instrument, given in London, the value of the device for blind people was demonstrated.

The optophone is a small camera-like box, open at one end, which, if pointed at the light, causes the instrument to produce sound which is transmitted by sensitive receivers of the type used in telephones. The accompanying illustration shows a blind man turning around, with the instrument in his hand, in order to ascertain the location of a window. The different tones, and degrees of sound, enable the user of



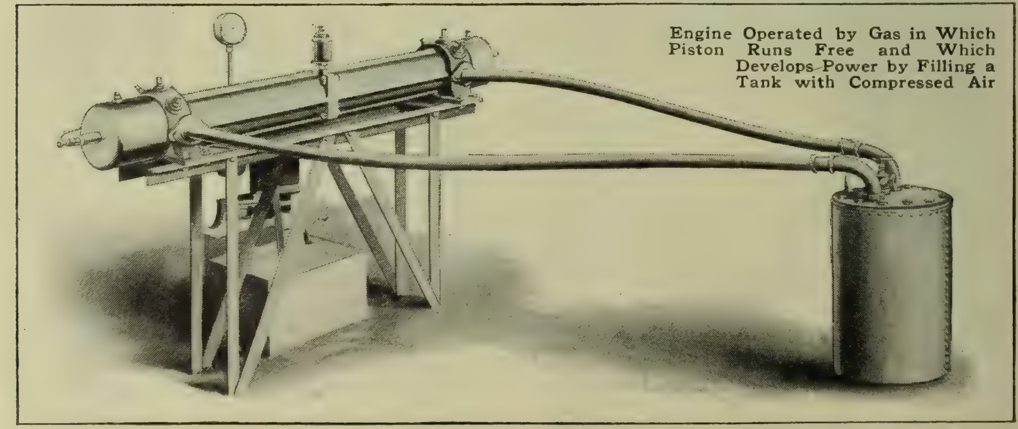
An Apparatus through Which the Blind are Enabled to Locate Light by Means of Sound. It Aids Them, for Instance, to Locate Windows and Open Doors the instrument to determine the character of the body passing between him and the light. By aid of the receivers the man shown in the picture was able to count six people who passed in front of him by the intervals of light between them. "On a moonlight night," asserts the inventor, "you can hear the moon and when the sun is shining you would recognize it by the tremendous noise it would make." Besides this use of the optophone, Mr. D'Albe expresses confidence that the invention will prove useful in discovering the light of stars that are not visible, as well as in many other directions. The invention is based on the well-known property of selenium of changing its electrical resistance under the influence of light. For three years Mr. D'Albe has been at work in perfecting his invention.

NOVEL GAS ENGINE FOR COMPRESSING AIR

An engine operated by oil fuel which has a free piston in a cylinder, and does not turn a flywheel, but simply pushes out air ahead of the piston as it shoots back and forth so that it fills a tank with compressed air is the novel idea of an Italian inventor. He claims that this method results in the development of a very large amount of power for the amount of fuel consumed.

The heavy piston, free in the cylinder, is propelled from one end to the other by the explosion of gas behind it. This pushes the air ahead of it out through a port, and then through a non-return valve to the compressed-air reservoir. After the piston passes the outlet ports, and is nearing the end of its trip through the cylinder, a charge of gas is automatically forced into the space ahead of the cylinder, while air is admitted automatically in the other end of the cylinder. The continued trip of the piston then compresses the gas in the little space ahead of it to a point where the temperature rises enough to explode it, and thus sends the piston back to the other end of the cylinder, where the same operation is completed, the air and products of the previous combustion ahead of it being meanwhile forced out into the reservoir tank. Special provision is made for starting the engine.

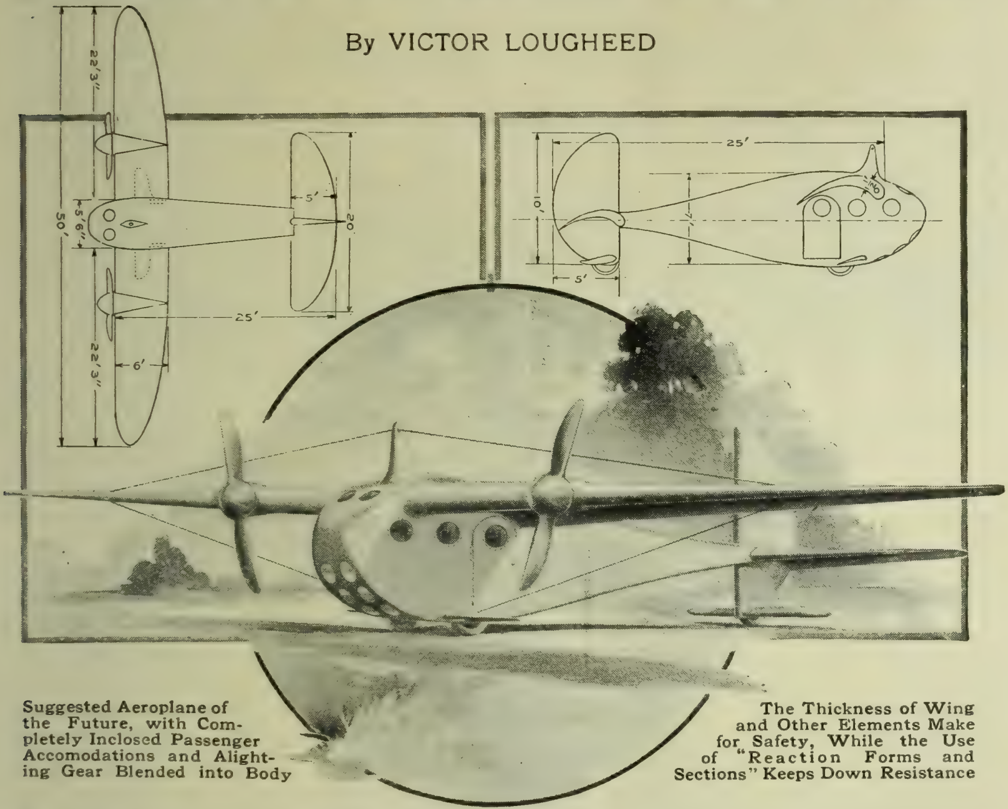
ℭThe Illinois Central Railroad publishes a magazine in each issue of which is run a series of full-page halftone reproductions of photographs showing some of the common ways in which accidents are caused. With each picture are given the names of employes recently killed by such carelessness as those portrayed, to make the warning more effective.



Engine Operated by Gas in Which Piston Runs Free and Which Develops Power by Filling a Tank with Compressed Air

What Present-Day Aeroplane Development Promises for the Machine of the Future

By VICTOR LOUGHEED

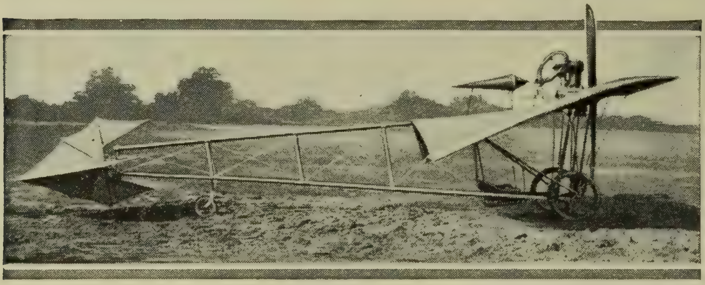


Suggested Aeroplane of the Future, with Completely Inclosed Passenger Accomodations and Alighting Gear Blended into Body

The Thickness of Wing and Other Elements Make for Safety, While the Use of "Reaction Forms and Sections" Keeps Down Resistance

YEARS ago, when the automobile was haltingly evolving from the queer contraptions and crude constructions of the earlier experimenters, few indeed were the engineers of the time with the vision to see into the future and discern any part of the wonderful development in transportation which has come into being from such unpromising beginnings. Yet, if we reverse the analysis we simplify the conditions, and few are the automobile experts of today who cannot glibly trace back the essential elements of the up-to-date motor car—the multicylinder engine vertical in front, the cellular radiator, the channel frame, the ball bearings, etc.—to their veriest beginnings in the shops of a comparatively few European pioneers, who, untrammeled by precedent, substituted for the long current notion of a "horseless carriage"—as negative in its merits as in its title—the idea and the fact of the "road locomotive," the king of the modern highway.

It is, therefore, but reasonable to believe that some practical idea of the aeroplane that the near future will produce can easily be gained by noting the advances that have already been made, for, it is obvious that in the development of human flight there are manifest the workings of similar phenomena. No more than the automobile has the aeroplane sprung, full-fledged, from the brow of some Jovian creator. The fact that the mob unfailingly demands heroes, to whom to accord credit for great achievements, need not blind more critical eyes to the profound differences between evolution and invention. And, as the months roll by, and the test of time proves always as sure as it always is ruthless, so is the way of progress strewn with the wrecks of things that have but incompletely served their purposes, things that have not justified the high hopes of their creators, and things that have merely helped, rather than defined, the growth of an engineering industry.



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Early French Monoplane—a Characteristic Machine of the Type in Which the Whole Structure is Open Trussing, with No Effort to Reduce Resistances by the Application of "Reaction Forms"

Times without number, the most consistent, well-financed, and long-persisted-in efforts to revolutionize the automobile have been remorselessly ground into impotent failure by the irresistible advance of the types of construction which now prevail because they are the products of mechanical evolution rather than of individual invention.

So must it be with the flying machine, and so, just as surely as there has been an almost biological evolution of the steamship and the railway, must there ultimately disappear the freak forms of (and the more freakish substitutes for) the one soundly conceived, really progressing vehicle of the skies—the aeroplane.

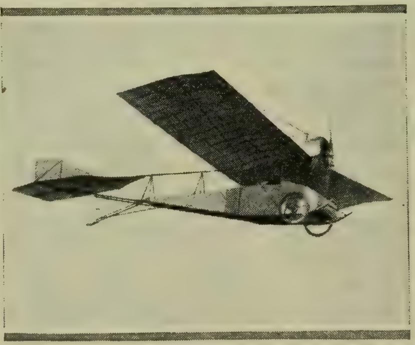
Dismissing then from present consideration such follies as the gasbag, and the thin-surfaced, wire-encumbered, bodyless types of aeroplanes, as of no continuing interest unless as bottomless sinks into which to plunge labor and capital, and murderous devices with which to slaughter the foolish and reckless, there remain the questions respecting the course aeroplane development is most likely to take.

For a beginning, if the foremost flight engineers of the time were to attempt to visualize for the layman a reasonable conception of the aeroplane of the future, there probably is one basis, and one basis only, upon which substantial agreement might be sought. The aeroplane of the future must be *birdlike.*

Every added fact of flight accomplishment, and every new discovery in the reluctant science of aerodynamics is most conclusively to this effect. There is not even the room for alternatives.

This is because in the aerial vehicle there is a condition not encountered elsewhere in the whole field of transportation. This condition is the complete immersion of the vehicle in a homogeneous fluid, every movement and reaction of which is subject to most definite laws, with safe and efficient operation absolutely conditioned upon proper interactions between *all* of the surfaces of the vehicle and the surrounding masses of air.

What can be more evident then, than the necessity for invariable and consistent adherence to the comparatively few fundamental principles of form that will normally interrelate with the similarly few and fundamental laws of the dynamic movements of elastic fluids? Is it reasonably conceivable or any way in evidence, for example, that the bird, devised by the same intelligence that devised the physical laws it operates under, is capable of anything



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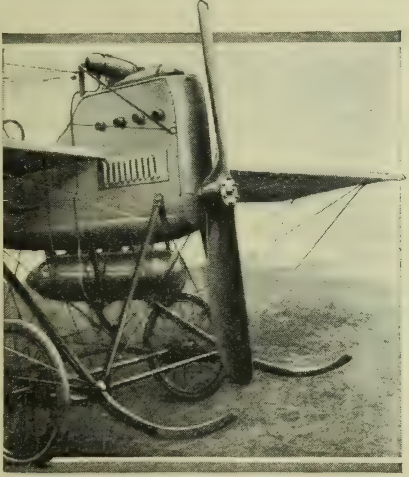
A Suggestion of the Future Type. The Train Monoplane, which Proved an Excellent Flier, but Which Unquestionably would Present Lower Forward Resistances were the Space between Body and Wings Closed Up, and the Whole Central Structure Blended into a Single Smooth-Contoured "Reaction Body" more than detail modification without wholly upsetting the harmony between its contours and the air streams, upon which its ideally safe and efficient flight depends?

The justice of these contentions admitted, further speculation is closely limited.

The aeroplane of the future, to be designed soundly, and built well, must be substantially a gigantic bird, differing from its natural prototype chiefly in such details as will be reasonably involved by the larger sizes, and substitution of a limited and simplified control for the complex coördinations between brain and structure in the natural device.

As in all mechanisms, of whatever types, there will be provided the results the case demands and tolerated the compromises the case permits. The first will usually be the problems and the second their solutions. And the correct combinations will prove invariably to be only those that are reasoned and tested out upon the broadest possible basis of scientific deduction and empirical check.



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The Maze of Struts, Wires, Tanks, etc., under the Body of This Deperdussin Monoplane Occasions More Head Resistance Than would be Set Up by a "Reaction Body" of Sufficient Size and Bulk to Inclose Them Completely

Already there exist tendencies that definitely point to at least the more immediate goals.

The speediest aeroplanes of today are not so generally the highest-powered as they are the most efficient.

The most efficient aeroplanes of today are blunt-bodied and thick-winged; these also are the strongest.

The safest aeroplanes of today are those in which controls are directional rather than stabilizing—leaving the latter function to be cared for largely by the form and interrelationships of the various surfaces, rather than dependent upon a constant juggling performance by the driver, or, worse, by some complex "automatic-balancing" contraption.

The launching and alighting of the most advanced aeroplanes of today can be from, or upon, either land or water, at the will of the pilot.

Such details as the number of propellers, their size, and their placing, have perhaps evolved to a less significant status than the more fundamental details just enumerated. Yet, even here certain main considerations are not to be escaped. As an example, the constant increase in body sizes, coincident with growing simplification of running gears, would seem to suggest that in the ultimate machine there will be a blending together of these two elements—involving the superseding of a present anomalous duality of structure by winged bodies, automobile-like or houseboat-like in general type, with their lower portions directly exerting the "running-gear" function, and the wings simply mounted rather high upon them. A placing of the center of gravity less low than the center of volume will avoid the objectionable pendulum effect of weight carried low, while the very small resistance of scientifically designed "reaction forms" will reduce to a negligible minimum the slightly unsymmetrical placing of the resistance.

This evolution of the body and alighting gear will in turn make increasingly difficult, however, the provision of room for large propeller swing that is so readily obtainable with many of the stilt-like structures at present in vogue.

Most obvious of the means of minimizing this difficulty will be the provision of twin propellers—a system that has other important advantages (including the elimination of unbalanced reaction and gyroscopic effects) to offset its mildly objectionable complication and added weight. Perhaps less obvious among the helps over the suggested obstacle will be the smaller thrust demanded by the more efficient machines of the future. Also, the increased huskiness of propeller blades of heavy reaction sections will lessen the need for liberal propeller clearance, now needed to preserve thin blades from damage through contact with grass, water, etc.

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Recent Nieuport Monoplane, in which the Shortness of the Landing Gear and the Low Placing of the Large Body Suggest That It would be Only a Slight Further Step to the Complete Amalgamation of These Elements

Because of the comparative safety of this as opposed to the alternative construction, the motors of the future machines will almost certainly be placed in front. This, in turn, with a single propeller, will almost demand its front placing, and with plural propellers is at least likely to influence the same placing, as that most simply and conveniently provided.

Structural integrity—immunity from breakage—must be secured in the future aeroplane as positively as it is secured in high-grade automobiles. Of the means to this fundamental condition of safety, there must be employed not only as good materials and better assemblage than is now common; there also must be employed members and surfaces of sufficient thickness to afford space for rigid trussing. And this, of course, will require the reduction of head resistances, not by the difficult, dangerous, and wholly unnecessary expedient of keeping down the projected area, but by the more scientific and bird-type construction, wherein the principle of the "reaction impulse" is made to nullify in large measure the head resistance. Even to the tension members of the structure must this principle be consistently extended, wherefore the aeroplane of the future may be reasonably expected to present only a few heavy and "streamlined" cables, in place of the multitude of fine wires so generally employed nowadays.

Another probable factor of future safety, wholly independent of safety obtainable by sound design and substantial construction, will doubtless appear in a more general recognition of the limitations of aerial navigation, leading to the same sort of cautious supervision and restriction of use that applies in navigation of the sea, where no mariner with his sanity about him would attempt fancy evolutions along a rocky coast in a storm, or put out of port in a typical Gulf hurricane or South Pacific typhoon. Indeed, instead of the reckless flying that has become so common with half-developed machines—flying from the roofs of buildings, under the bridge at Niagara Falls, etc.,—there may be expected a safe and sane flying from large, prepared land or smooth water areas from selected start to specified destination.

The materials of which the aeroplane of the future will be built are likely to remain much the same as at present.

Fabric would seem in every way superior, in strength, durability, and ease of application, to wood and sheet metal, sometimes proposed as substitutes for it for wing surfacing. The use of fabric for the sails of boats, which involves analogous requirements, is rather suggestive on this score.

Wood also possesses superlative merits, and although steel may supplant it for wing bars and some elements of the framing, wood is likely to persist for a long time in rib construction, body work, etc.

Of course, the aeroplane of the future will afford complete inclosure of the passengers, because of the reduced resistance to be secured in this way, as well as for reasons of comfort and safety.

In the matter of finish, there is no question that better weatherproofing than is now made will be necessary, as the only possible means of preventing rapid deterioration. If, in addition to this, the paints and varnishes employed can be made at least fairly fireproof as well, the increase in safety is one to be sought for.

The question of the power for future flying is likely to require less special solving than at present. The high efficiency of the machines of the future will make high reliability more important in motors than light weight and extreme power, so probably the aeroplane motor will always remain substantially a close counterpart of the internal-combustion motors in motorboats and automobiles.

The controls of the future machine, as has already been suggested, are likely to become purely directional rather than stabilizing, making them measurably surer in operation and somewhat simpler to manipulate.

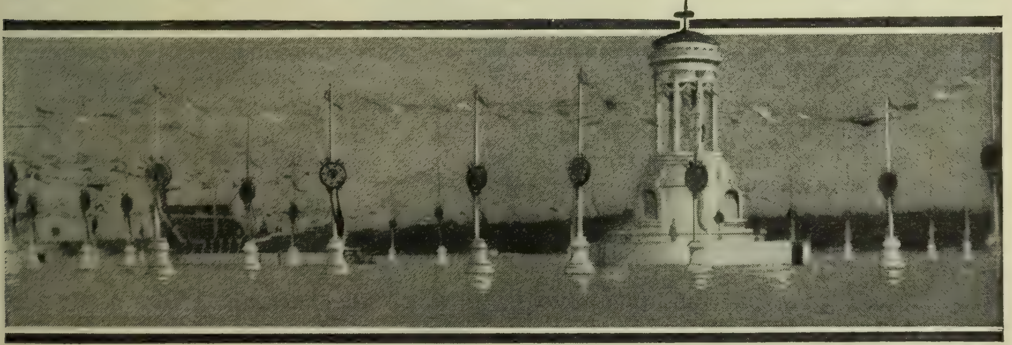
The question of whether "wing warping" is to endure will be regarded by many as very debatable, and there is much reason for supposing that its place may be taken by controlling systems that overcome its objectionable feature of increasing the resistance on the side of the machine that requires to increase in speed.

The question of speed can be very well left to rest on present accomplishments. Already one French monoplane has repeatedly proved capable of a speed of 105 miles an hour in going round and round a closed course, with the reasonable probability that it can do 115 or 120 miles in straight-away flying. The aeroplane of the future doubtless will be faster, but if it even remains only as fast—probably with less power than is now required—its utility, insofar as this relates to speed, will be superior to that of all other vehicles.

DETROIT'S ILLUMINATED WATER COURT

One of the finest features of this year's "Cadillaqua" at Detroit, the birthday party held by that city to celebrate its founding by Cadillac in 1701, was the court of honor erected in the river between Belle Isle and the Detroit shore, a view of which is shown in the accompanying illustration.

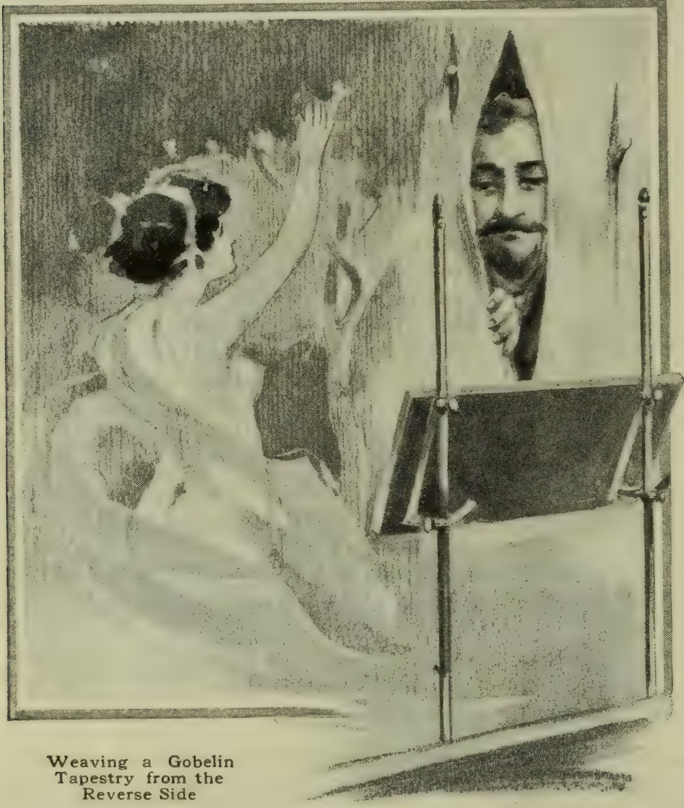
Constructed on piles, it was 1,500 ft. long and 300 ft. wide, with three immense fountains as the central fea-



The Cadillaqua Water Court by Day, Showing Cadillac Memorial Fountain tures. Two huge galleys were provided to accommodate bands and musicians, and pennants, streamers, and Indian shields decorated the posts of the court. In the daytime the court presented a gay and inspiring scene, but at night, with its fine illumination, the scene was magnificent. The fountains, with water falling in sheets from one bowl to another, were illuminated with red, white and green lights.

GOBELIN TAPESTRIES WOVEN FROM THE REVERSE SIDE

The famous Gobelin tapestries, which are still turned out by the historic Gobelin factory, are woven from the reverse side. The weaver works facing the back side of the tapestry, and, every once in a while, parts the threads and looks through at the mirror in which the design is reflected. Some of the tapestries take years to make, and sell for as much as $30,000. The factory was originally founded by the Gobelin family, but is now owned by the French government.



Weaving a Gobelin Tapestry from the Reverse Side

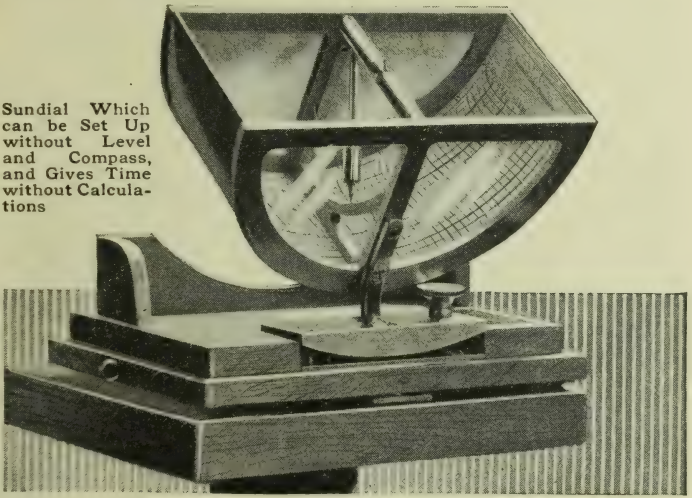
NEW RECORD FOR WIRELESS FROM AEROPLANE

Most persistent and successful attempts are being made by French army officers to render thoroughly practical the application of wireless telegraphy to aeroplanes. The latest achievement in this field, by Lieut. Manger-Devarennes, consisted in the sending of messages to St. Cyr, France, while in flight over the surrounding country. Communication was easily maintained from as far away as Meaux, a distance of 15 miles, and hopes based upon new experiments and calculations are entertained of soon increasing the distance to from 90 to 130 miles, by suitable changes in the apparatus. A point of interest to the wireless enthusiast will be the fact that it has been definitely determined that a mere substitute in the way of an equivalent of the usual antenna is insufficient to secure useful results, and that there must be an equivalent of the ground as well.

By employing the wires of the machine as the antenna, and trailing a length of wire for the other end of the circuit, a sufficient capacity is secured in the two elements to insure the effective oscillations of high-tension current upon which success in wireless transmission is now known to depend. In gauging the comparative quality of different feats of wireless telegraphy from aeroplanes, it is especially important to distinguish between mere feats of receiving, and the cases in which actual communication both ways is maintained. It is comparatively simple to provide an apparatus that will receive messages, but when it comes to sending for any distance the problem becomes much more difficult.

SUNDIAL WHICH MAY BE READILY SET UP

A sundial which can be readily set up without the aid of a compass and level, and used without the otherwise necessary involved calculations, has been constructed in England. The essential part of the instrument is the flexible, reversible dial, which, in fact, is the part which obviates all calculations and allowances when the time is read. For an instrument of its class it is of such unusual accuracy that it has been termed a solar chronometer. Briefly described, the instrument, which is made of metal, consists of a rectangular frame attached to a curved plate which carries a flexible dial. The dial is reversible, and is marked on its two faces with specially curved "hour lines" and straight "date lines," each face containing dates for six months. A polar axis is fixed to the frame and formed so as to project the shadow indicating the time, its special shape conducing to great accuracy. Latitude is indicated on a graduated arc by a freely suspended pointer. The instrument is attached to its base by a ball and socket with clamp, by means of which it can be adjusted and set in any position and at any inclination. The possibility of placing the solar chronometer in the meridian by its own indications has been taken advantage of for utilizing the instrument as an astronomical compass. For this purpose a simple attachment is provided, by the aid of which a line can be run true north and south independent of local or magnetic influences. This attachment consists of the usual graduated circles with a double sight fitted at each end for sighting backward or forward. It can be placed horizontally at right angles to the rectangular frame, which lies east and west when the instrument is in position. It follows that a line through the sighting vanes runs north and south.

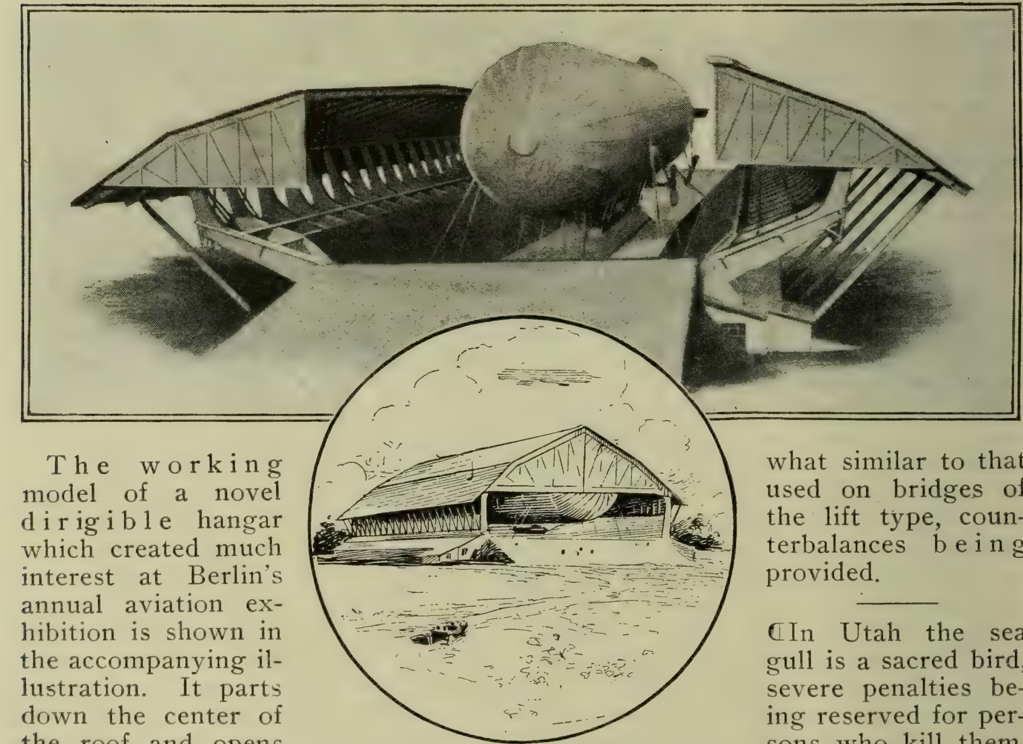

Sundial Which can be Set Up without Level and Compass, and Gives Time without Calculations

To adjust the instrument for latitude before taking an observation, it is placed on any surface in the sunshine; the pendulum suspended above the latitude arc is allowed to swing free while the dial holder is tilted until the pendulum points to the latitude of the place on the arc, the latitude having been obtained from an atlas. In order, next, to place the instrument in the meridian, the shadow of the meeting points is brought on to the date line of the day by turning the whole instrument with its base round bodily. Careful adjusting is required here.

The position of the shadow of the meeting points on the dial will then indicate the correct time without any calculation or allowance. The time indicated will be either standard time or local mean time, according to the setting of the flexible dial in the metal curve. The hours are indicated by thick, continuous curved lines marked with Roman numerals and each hour is subdivided to ten minutes by fine and dotted curved lines. The ten minutes can be subdivided mentally, the shape of the shadow rendering it easy to estimate time to within one or two minutes. The most favorable time for an observation is before 9 a. m. or after 3 p. m. As to accuracy obtained in latitudes between 30 deg. north and 30 deg. south of the equator, observations made between 7 a. m. and 8 a. m., and between 4 p. m. and 5 p. m. will give results to within about one minute of true time, while in more northerly or more southerly latitudes, observations made at the same hours will give the correct time within about two minutes.

The instrument can be set to indicate either local mean time, or the standard time of any country. For example, a dial in use in Dublin could be set to indicate Greenwich time.

A NOVEL GERMAN HANGAR



Upper View—Model Hangar Which Opens at Top to Release Airship

Lower View—Appearance of Hangar Closed with Dirigible Lodged Within

The working model of a novel dirigible hangar which created much interest at Berlin's annual aviation exhibition is shown in the accompanying illustration. It parts down the center of the roof and opens completely out, leaving the dirigible in the open air. The opening and closing is accomplished by a mechanism somewhat similar to that used on bridges of the lift type, counterbalances being provided.

¶In Utah the sea gull is a sacred bird, severe penalties being reserved for persons who kill them. In the early days of the Mormon state sea gulls rescued the crops by killing and eating swarms of grasshoppers.

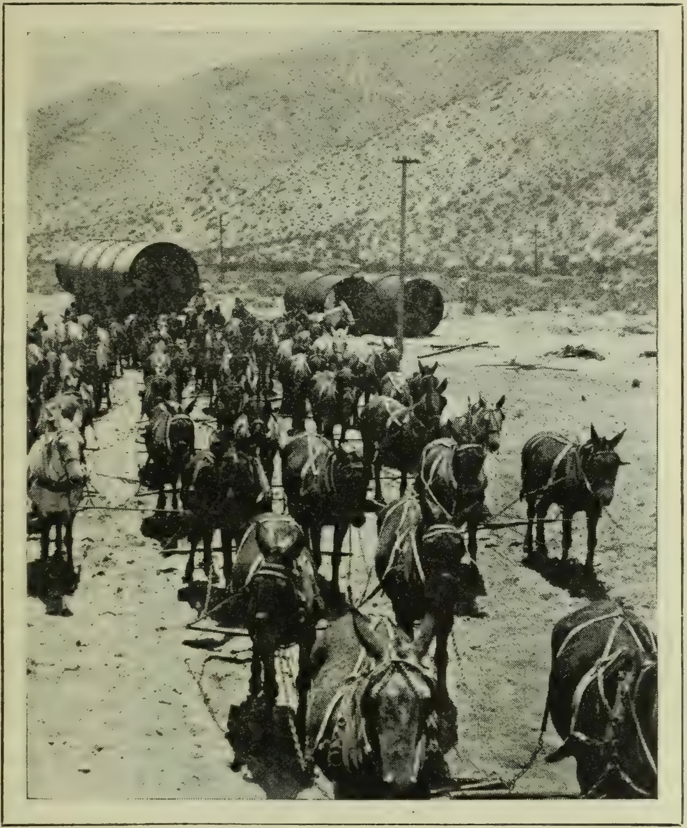
CONQUERING MALARIA IN ITALY

Marked success has attended the efforts of railway and health officials in Italy who for several years have been waging a fight against the malarial mosquito along the lines of Italian railways. Thirty years ago conditions were so bad in a certain section of the country that one railway had to maintain a triple staff in order that regularity of service might be assured. After the famous discovery that the mosquito was responsible for the prevalence of the disease an earnest defensive campaign was instituted. The work was hindered by the opposition of ignorant employes of the railways who were skeptical of the methods advocated by scientists. These included liberal dosing with quinine, the wearing of gloves and gauze hoods and the covering of doors, windows and chimneys of houses with a wire netting of fine mesh. As a result of the precautions taken, the percentage of fever cases in infected districts has been reduced from 87.12 in 1880 to 13.26 in 1911.

A FRIENDSHIP GARDEN

A sentimental idea for an odd corner of the flower garden is to use it as a "garden of friendship." Each friend, on his or her first visit to the garden, places a small plant in this corner, and beside it a metal label bearing the name of the planter. The plant is then left to grow and forms a living reminder of the friend.

FIFTY-TWO MULES HAUL GREAT PIPE


Team of 52 Mules Hauling 24-Ton Steel Pipe

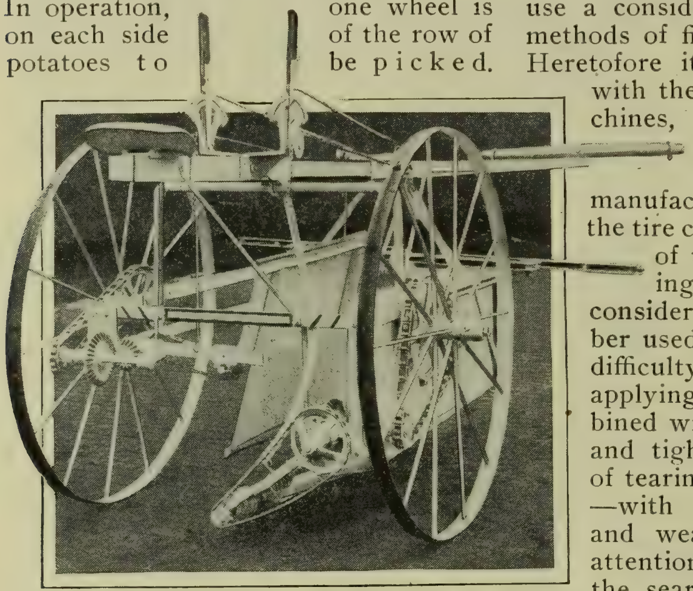
All mule-team records were broken, it is declared, by the builders of the Los Angeles aqueduct when fifty-two mules, as shown in the accompanying illustration, were hitched together to transport steel siphons used in constructing the aqueduct. A single jerk line was used in handling the team. In most instances the weight of the steel sections was 24 tons. The total length of the siphons used in the aqueduct was about 14 miles.

The larger part of the steel used was forwarded by freight in plates and riveted in the field. When making the heavier pieces, for use in the largest siphons, it was found that they would have to be treated at the steel shops and shipped complete. Then there was presented the problem of hauling a 24-ton pipe, often 11 ft. in diameter, four miles on rising ground. Employment of the 52-mule team solved the problem.

During the progress of the work the experiment was made of supplanting the mules by caterpillar engines but whereas the cost by mule power was about 12 cents a mile per ton, the cost by engine ran to 29 cents. With this showing in economy, it was only natural that the mules were "put back on the job."

MACHINE CAPTURES AND KILLS POTATO BUGS

A practical device for disposing of potato bugs without poison is now being manufactured in large quantities. In operation, one wheel is on each side of the row of potatoes to be picked. Two revolving plates, tipped with canvas, rapidly brush the bugs from the vines over into the apron shown near the right wheel. At the bottom of this apron the edge is turned up so as to form a gutter or trough and thus prevent the bugs from falling to the ground. In this trough is a small spiral conveyor which carries them toward the rear, where a pair of steel disks crush them and drop them back onto the ground.



Bug-Killing Machine, the Revolving Plates Brushing the Bugs into an Apron

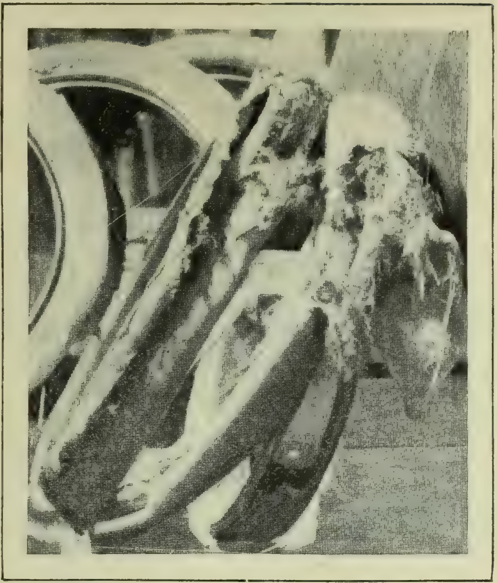
Adjusting devices, which are easily controlled by the driver from his seat, are provided for different heights of vines.

NEW METHOD OF PROOFING WING FABRICS

In the factories of the big aeroplane constructors of France, England, and Germany, there has recently come into use a considerable innovation in the methods of finishing aeroplane wings. Heretofore it has been the practice, with the builders of the best machines, to cover the sustaining and other surfaces with the rubberized fabrics manufactured for this purpose by the tire companies. The experience of thousands of miles of flying, however, has disclosed considerable shortcomings in rubber used for this purpose, so the difficulty of stitching through and applying the coated cloth, combined with its tendency to loosen and tighten—even to the extent of tearing loose from the framing—with changes in temperature and weather, has caused much attention to be directed toward the search for a substitute. Of these, the most successful, and the ones at present most widely in use, consist of collodion varnishes made from the new noninflammable acetyl-celluloses. These are applied after the wing is made, thus facilitating its manufacture, and protecting the seams as well as the surface proper. Also, by their use, it is found possible to secure and maintain any desired tautness of fabric. All ordinary exposure to water, sun, and cold weather are without deleterious effect, and the fireproof quality, while not the best that might be desired, is measurably superior to that of the rubberized fabrics. Not the least of the merits of the new process is its cheapness.

AUTO TIRES AFTER USE IN RACE

Automobile racing wears out tires in a matter of minutes, as compared with weeks of ordinary running, due largely to the tearing effect on the tires when curves are rounded. The accompanying photograph shows the condition of two tires which saw service on the Indianapolis speedway.



Courtesy Motor

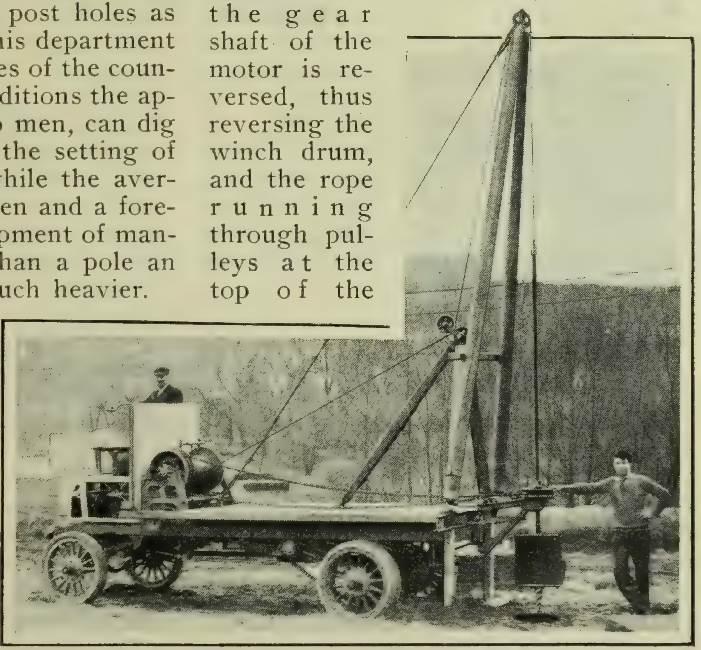
Automobile Tires after Use on Car in Indianapolis Racing

ℭWhile King George V of England is rated as a very great man among his subjects and receives all sorts of tributes of respect, in the London telephone directory he gets no special favor, his private telephone being "Westminster, 832." The telephone number of the President of the United States at Washington is "Main, 6," while President Madero's of Mexico is simply "Negra, 10."

HOLE - DIGGING AND POST - SETTING AUTOMOBILE

A motor truck which not only lifts and sets telephone and telegraph poles in position but digs the post holes as well, is revolutionizing this department of work in the larger cities of the country. Under ordinary conditions the apparatus, operated by two men, can dig the holes and complete the setting of two poles in an hour, while the average for a gang of nine men and a foreman, with the usual equipment of manual labor, is not more than a pole an hour and the work is much heavier.

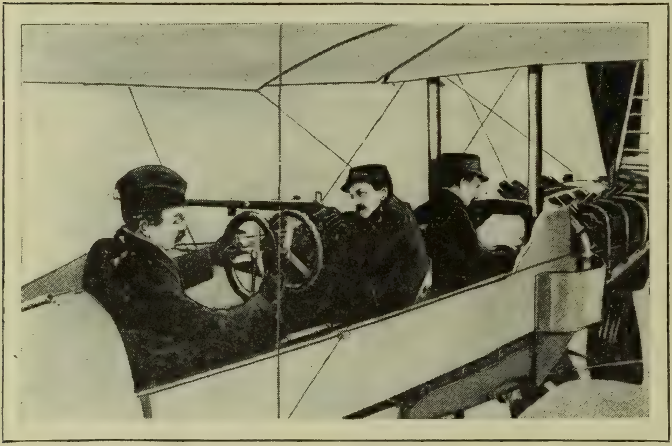
The pole-setting derrick is located on the rear of the truck and is supported by a transverse beam. The drilling apparatus, also at the rear of the truck, is driven by the motor through a winch connected by an endless chain to a pulley which has a threaded center and is fixed to the bracket carrying the drill. The drill may be driven into the earth a distance of 6½ ft., after which the gear shaft of the motor is reversed, thus reversing the winch drum, and the rope running through pulleys at the top of the



Apparatus Which Digs Post Holes and Lifts and Sets the Poles in Position derrick and attached to the drill draws the latter out of the ground together with the earth attached.

THREE-SEATED MILITARY AEROPLANE

Among the French military aeroplanes recently turned over to the army are several of the Breguet type of monoplanes. These machines are three-seated, accommodating the pilot and two men. The positions the three men occupy in the machine are shown in the accompanying illustration. As here seen an officer is seated where he can study his military maps and make diagrams of an enemy's position, while the private soldier is handling a rifle as he would were one of the enemy's aeroplanes giving chase.



One of the Three-Seated Monoplanes of the French Army

LIME AS A FOOD AND CURE FOR MANY ILLS

A teaspoonful of chloride of calcium, three times a day, dissolved in water, is healthful and nourishing, according to the German professors Emerich and Loew. Lime, if taken in slight quantities as food, they contend, is a preventive and a cure of many physical ills which now afflict humanity, increasing the vitality of the organism, protecting it from harmful microbes, and curing inflammatory affections.

Instead of throwing away the shells when one eats eggs, it would be better to eat the shells and discard the yolk and white, according to the personal view of these professors.

RAILROAD TO FIGHT MOSQUITOES

Extermination of mosquitoes along its lines will be attempted by the Illinois Central railroad through the employment of goldfish minnows, a natural enemy of the insects. The chief surgeon of the road is responsible for the experiment which will be the first of the kind attempted, so far as known. All stagnant pools, breeding places of the mosquito, will be stocked with the minnows and as all minnows eat the larvæ of mosquitoes, it is believed the destruction of the pest will be rapid and complete. In this work it is necessary to use the goldfish minnows, as they are the only species able to survive in stagnant water. In cleaning up the breeding places it is hoped to stamp out malaria and typhoid fever, diseases for which the mosquito is held chiefly responsible. The experiment will be carried out in all states traversed by the Illinois Central, though the greatest benefit is expected to result in the states south of the Ohio River, where there is much swamp land.

¶In the hope of finding a commercial substitute for gasoline, Charles Y. Knight, an American now residing in Warwickshire, England, has established a laboratory and is experimenting with shale oil and other indigenous fuels.

READING A WHOLE PAGE AT A GLANCE

An eminent eastern eye specialist reports, in the Journal of the American Medical Association, the case of a patient, a highly intelligent, educated man, a great reader, who could at a mere glance of a second or two, see and read a whole page of an ordinary book and know thoroughly its contents. This depended on a pathologic or abnormal condition of one of his eyes.

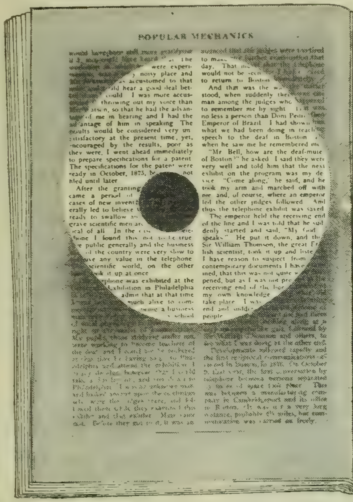


Fig. 1 — Abnormal Eye of Man Who Could Read Whole Page at a Glance, the Black Spot, or Macula, Being Blind and the White Portion Recording Images Clearly

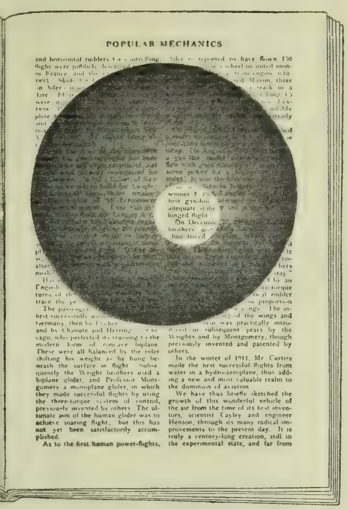


Fig. 2 — Diagram of Normal Eye, the Clearness of Vision in Different Parts of the Retina Being Indicated by the Amount of White Space

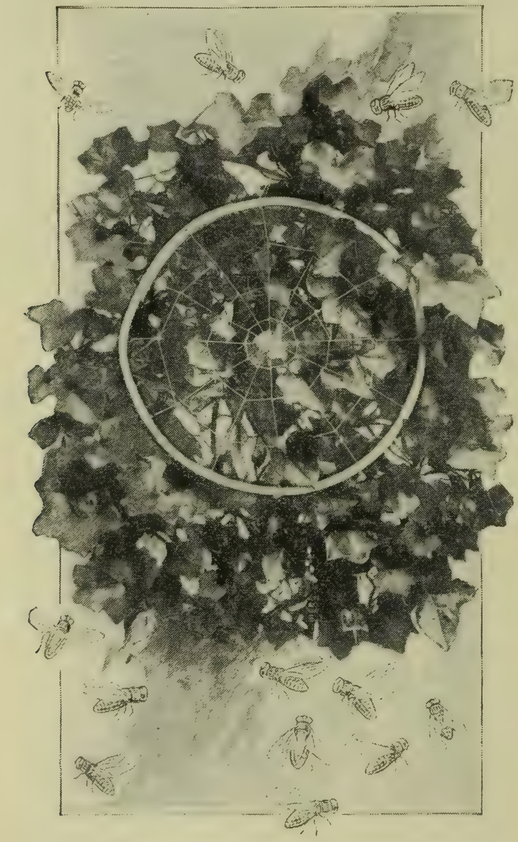
The person with normal vision can see distinctly, without moving his eyes, only a few words in each line and must move his eyes constantly in reading. The reason is that in the retina, the structure at the back of each eyeball on which the image is received, there is a small area near the center, the macula, on which is focused and defined distinctly a certain small portion of the object looked at, and the outer portion of the retina sees the remainder of the image in diminishing degree of distinctness the greater the distance from the macular area. The reader can prove this for himself. On looking at this page one can see the letters and words on the whole page, but can read only a few of them at a time without moving the eye, even by a special effort. The macula of each eye conveys a similar impression to the brain through the optic nerve, and they are converted by the brain into a single image. This produces what is called single binocular vision. It is true, however, that even in normal eyes with single binocular vision one eye is the dominant or fixing eye, the other eye following the dominant one. This is the right eye in right-handed persons and the left in left-handed persons.

The gentleman in question in early life had had normal vision, with a dominant right eye, but vision in the macular area of this right eye had been destroyed by an inflammation some years later. Nature had then responded to the voluntary efforts and practice of the patient and the whole surrounding portion of the retina of the right eye had gradually become more sensitive and capable of giving distinct definition to images thrown upon its whole area; but in the central or macular area of this eye he was entirely blind. The condition of the two eyes is shown in the accompanying diagrams. In Fig. 1, representing the retina of the abnormal eye, the black spot shows the blind macular area; the outer clear portion represents the large area of clear definition of images. Figure 2 shows the normal eye, with normal macular area, in which definition of objects is distinct, the outer dotted portion representing the remainder of the retina in which definition becomes more indistinct as the periphery is approached. It will at once be seen that the normal eye supplied the central deficiency of the abnormal eye, and the enormously increased area of distinct vision in the outer portion of the right retina enabled the patient to see and read at a glance the whole page. The ability to read a whole page in this way developed only in middle life, years after the injury to his right eye.

It is worth recording, too, that this gentleman also had a marvelously retentive memory and could remember whole passages or pages of poetry, or other matter, which he could acquire almost instantly with his abnormal visual powers, and he thus had a tremendous advantage in the acquisition of knowledge, over the ordinary individual who is really handicapped by two merely perfect eyes.

ARTIFICIAL SPIDER'S WEB AS FLY CATCHER

The "swat-the-fly" crusade has been responded to even more enthusiastically by the general public in England than in America, and particularly by the younger generation. Many ingenious fly-killing or capturing devices have been constructed by amateur fly slayers, one of which is an artificial spider's web, such as that shown in the illustration.



A "Tanglefoot" Imitation Spider's Web for the Catching of Flies

The artificial web is made by stretching strings across a child's wooden hoop, or an old barrel hoop, in imitation of the work of a spider, and then these strings are painted with sticky material. A piece of meat or fish, placed in the web, attracts the flies.

THREE MILLION DOLLARS IN MUSHROOMS

One of the most important industries carried on in the suburbs of Paris is that of mushroom growing. To one who has never investigated this industry the methods in vogue are of special interest. In the various districts surrounding the French capital there are numerous old quarries and in these subterranean caverns mushrooms are planted and grown to maturity. Scattered all around one may see quadrangular wooden towers which are the shafts used for ventilation of the quarries. Some of these were the source of the stone and plaster used by medieval builders in erecting great public edifices in Paris.

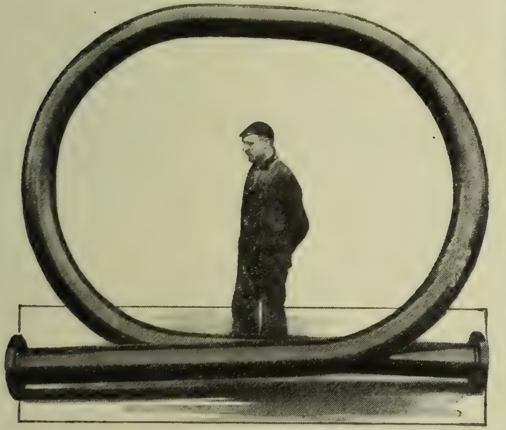
In general they consist of a labyrinth of low and narrow chambers. In them are found conditions of temperature and humidity favorable to the culture of the mushroom. Provision for ventilation is essential and wells are dug for supplying the large amount of water necessary in this form of "farming." Another indispensable thing is horse manure, preference being given to the kind which is the product of highly nitrogenous food. Before the manure is taken underground it is submitted to the action of the air for three weeks and is turned over from time to time to retard the process of fermentation. After lowering the prepared manure into the galleries, workmen arrange it in rounded beds which are carefully alined along the sides of the galleries. In these beds the mushroom spores are germinated. There are 250 mushroom "installations" in the vicinity of Paris and 1,000 workmen are employed.

The value of the product, which is much sought by the gourmets of Paris, is about $3,000,000 annually.

TWO UNUSUAL STEAM-PIPE BENDS

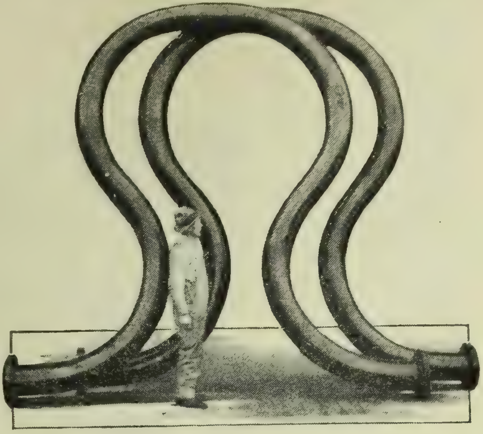
The unusual pipe bends shown in the accompanying illustrations were made for the purpose of overcoming the vibrations in steam-supply lines, set up by the cutting off of the engine valves when the pipe connections are short.

The circle expansion-pipe bend was installed in a plant in St. Louis, Mo., where the connections on boilers and headers in the original installation of the steam-pipe line were very short. In operation it was found to be impossible to overcome vibration and expansion with a straight pipe line. The pipe bend contains 34 ft. of 8-in., 28-lb. pipe.



Novel Circle Expansion Pipe, Installed to Overcome Vibrations in a Steam Line

The "N" pipe bends shown in the other illustration were made for installation in a plant in Lethbridge, Canada. The working steam pressure of the line is 160 lb. The engineer of the plant preferred to take care of expansion with these bends rather than with sliding expansion joints.



Unusual "N"-Shaped Bends Installed in a Canadian Plant in Preference to Sliding Expansion Joints

THE CORK USED FOR CARBURETOR FLOATS

The cork used for floats in carburetors must be of the best quality obtainable. The manufacturer of one of the best-known types of carburetors imports the material from Spain and Portugal, where the best cork-oak trees grow. The trees must be over 40 years old before the bark is available for cutting, and then the cork can be cut only once every eight or ten years.

Being very firm and close in texture, composed of millions of tiny cells, each of which contains, according to Motor Age, a bit of entrapped air, hermetically sealed, cork is especially adapted for carburetor floats. Also, its peculiar cellular structure gives it an exceptionally low heat conductivity. The cork floats are not affected by heat changes, either by extreme heat or cold, moisture, or boiling gasoline.

Each cork float receives three coats of shellac in preparation for use in the carburetors.

FERTILIZER FACTORIES ON SHIPBOARD

Blubber and whalebone are no longer the only source of profit in the whaling business. When whales were hand harpooned, the effect on the carcass was such that it soon sank. In those days the whale's body was lashed along the side of the ship, the blubber torn off in great strips and hoisted into the trying vats. After detaching all the available blubber, removing the whalebone from the mouth, and making sure that no ambergris had remained undetected, the remainder of the carcass was cast off as food for the myriads living in the lower depths.

The modern method of killing whales is by shooting them with an explosive bomb which penetrates the body of the whale for several feet and then explodes, causing instant death. A whale killed in this manner will float for weeks. Recently this fact was taken advantage of by a whaler who cruises in the vicinity of the Cape of Good Hope. At a convenient point on shore he built a modern fertilizer plant, completely equipped with the most modern American machinery. Working within a radius of 300 or 400 miles from this plant, he tows his kill ashore and after working up the whale oil, whalebone, ambergris, etc., converts all that remains of the body into a high-grade fertilizer. His profits were at once greatly increased and his example soon followed by others in the same line of business.

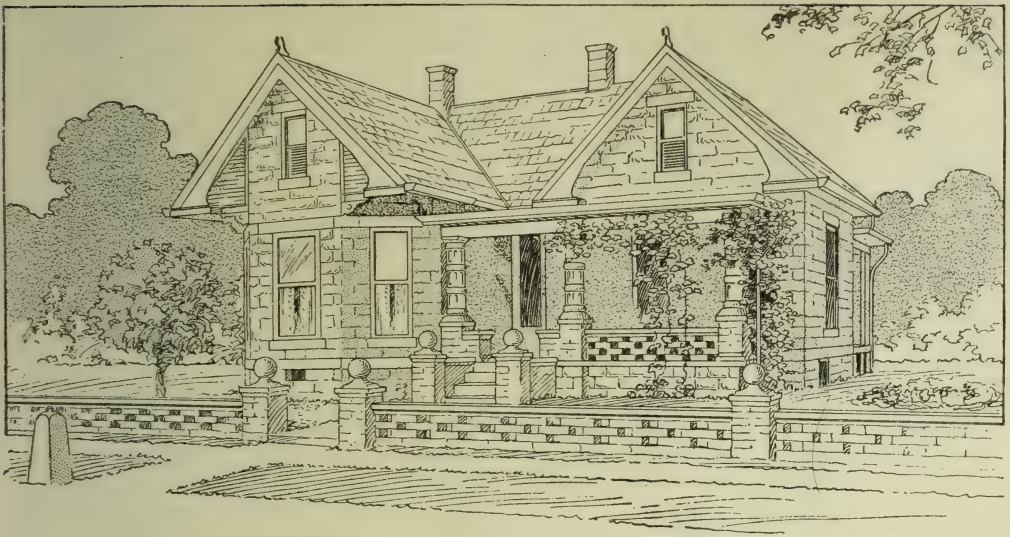
Totem Poles. Made on Electric-Light Standards, Lined the Streets of Seattle at Its Annual Carnival of the "Golden Potlatch"

During the past year another enterprising whaler has fitted up his ship as a floating fertilizer factory. He has installed enormous American fertilizer driers, large presses, mills and tanks, and thus is not confined to a limited radius. He hunts his prey where he may and without loss of time immediately converts the whole carcass into merchantable commodities.

In the days when all communication with the far east was by sailing around the Cape of Good Hope, many weird stories were told of phantom ships manned by ghostly figures and often accompanied by most disagreeable odors. These were supposed to be the haunting spirits of vessels whose entire crew had perished by plague, and were a source of great terror to the hardy seafarer. In the future, whenever a boat passes to the lee of one of these fertilizer ships, the sailors will be reminded of those strange tales of long ago.

WARNING AGAINST "SAFETY" FLANNELETTE

The British Fire-Prevention Committee warns the public against what is known as "safety" flannelette. A series of tests were made with this kind of flannelette and the material flamed very rapidly and in a dangerous manner; so much so, in fact, that the whole amount tested was consumed within a few seconds.



Front Elevation of Low-Price Concrete-Block House

WIRELESS IN OUT-OF-THE-WAY PLACES

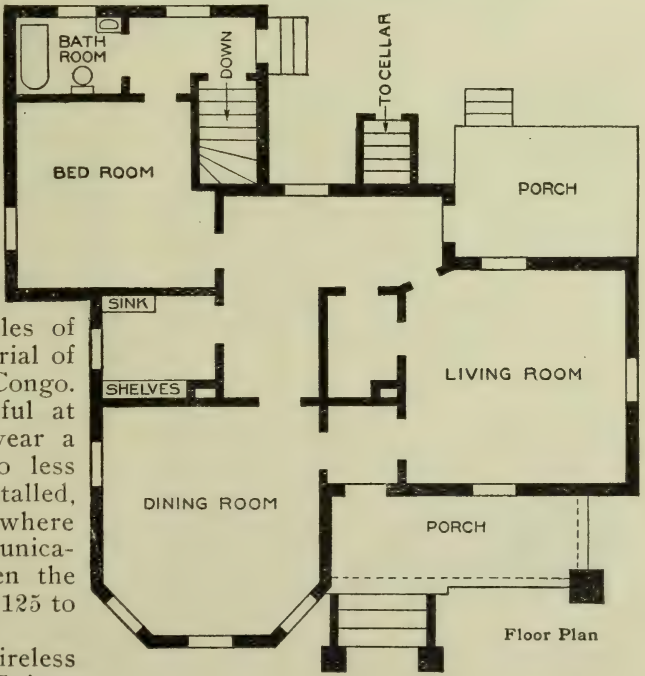
The suitability of the wireless telegraph in unsettled, out-of-the-way places of the world has already been proven by Belgium in the Congo Free State, and the German government has recently given a wireless company concession to install and operate a number of stations in German New Guinea and on several of the Caroline Islands.

The difficulty and enormous expense of erecting and maintaining ordinary telegraph lines in the jungles of Africa resulted in an early trial of the wireless in the Belgian Congo. This did not prove successful at first, but during the past year a wireless system totaling no less than 3,000 miles has been installed, so that all the main villages, where white men live, are in communication. The distances between the wireless stations range from 125 to 350 miles.

It is expected that the wireless stations in German New Guinea will be ready for operation early next year.

HOUSE BUILT OF CONCRETE BLOCKS FOR $2,000

Although there are many forms of concrete houses, either monolithic or built of blocks, few of them possess the features of the house shown herewith, built at the cost of $2,000, on the basis

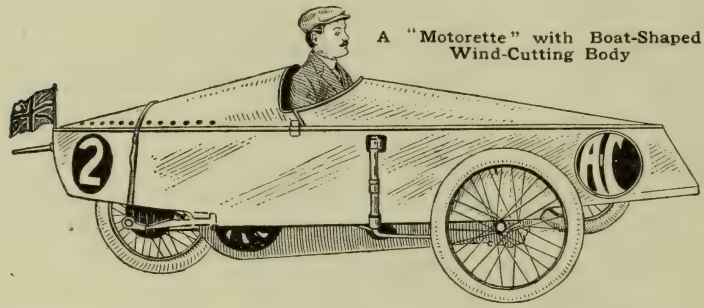


Floor Plan

of prices of materials and labor in Indiana. The concrete blocks are 8 in. by 8 in. by 16 in. and are faced with coarse sand, in a mixture of 1 part cement to 1½ parts sand. The body mixture is of 1 part cement to 3½ parts bank gravel. It will be noted that concrete lattice blocks are used in the fence and on the porch, and concrete balls surmount the newel posts. It is stated that the square part of the columns is of 4 in. by 8 in. by 16 in. block, while the caps on the fence and balustrade and on the columns, also the base of the columns as well as the base of the newels, were cast in wood molds locally made, as were the molds for the window sills.

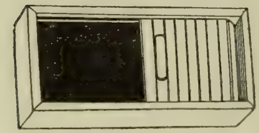
A RACING "MOTORETTE" AT BROOKLANDS

The "motorette" or three-wheeled motorcycle played a prominent part in recent motorcycle races at the famous Brooklands course in England. Among these little cars one of the most interesting was provided with a new wind-cutting body, which gave it a rather boatlike appearance. The marine effect was heightened by the flying of a little British flag at the stern.


A "Motorette" with Boat-Shaped Wind-Cutting Body

STAMP PAD WITH ROLL-TOP

The fact that the ordinary stamp pad, inclosed in a hinged tin box, is liable to become soiled with dust, and is unhandy either because the cover does not close tight enough, or too tight, has caused one stamp-pad manufacturer to place on the market a pad in a wooden box having a roll-top. The roll-top is so nicely fitted that a mere touch with the finger will open or close it.



LOS ANGELES HAPPENINGS IN WEEKLY PICTURES

Although motion-picture theaters are provided by several companies with sets of motion pictures showing the important and sensational happenings of each week in all parts of the country, Los Angeles is the first city in which the experiment of a strictly local "weekly," as such pictures are called, has been attempted.

The first weekly number was issued the latter part of June, and the experiment is being watched with interest by motion-picture concerns. The Los Angeles' company inaugurating the local weekly made arrangements with the newspapers of that city to receive immediate notice of every news story "breaking" within 100 miles, and two motion-picture camera operators were placed on duty to cover daily assignments.

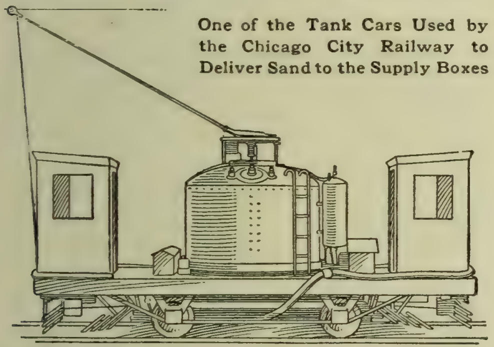
WILBUR WRIGHT'S LAST WORD ON AVIATION

That the aeroplane of the future must be perfected to the point where it can remain in the air once it has ascended was the contention of Wilbur Wright in a letter written by him shortly before his death. The letter was addressed to a well-known German airman and was received by him at the aviation grounds near Berlin. The difficulty, wrote the famous

American, is that "nature provides birds with the means of soaring without exerting themselves, while humans must devise artificial means of achieving the same results. The real problem now confronting us is to find out whether we, too, like the birds—once we are in the air—can stay in it indefinitely. The bird can do it. Why shouldn't men?"

CHICAGO CITY RAILWAY'S SAND-TANK CARS

The Chicago City Railway operates two specially constructed cars for the delivery of sand to the supply boxes from which the train crews fill the sand boxes on the cars. The supply boxes are located at some 75 different points. The ordinary single-truck car previously used for the transportation of sand proved inadequate, so the company constructed two tank cars provided with unloading apparatus. The capacity of the sand tank is 24,500 lb. of dry sand up to the dome, the balance of the space being left for air storage. The sand is pneumatically discharged into the supply boxes through a 3-in. wire-wound hose.


One of the Tank Cars Used by the Chicago City Railway to Deliver Sand to the Supply Boxes

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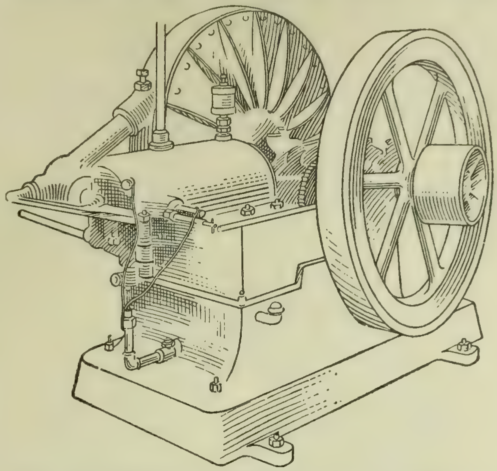
EXHAUST GAS DIRECTED AGAINST FLYWHEEL

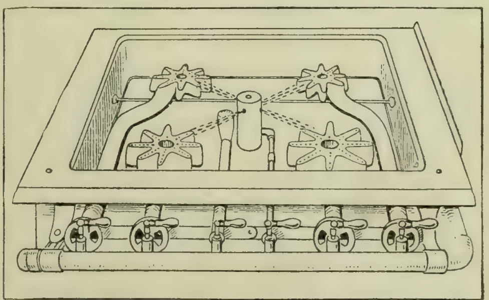
Of the many ways devised to utilize the exhaust of gas engines, the method applied in the so-called "compound gas engine" seems particularly interesting. In this engine the cylinder exhaust is discharged directly against one of the flywheels, which is encased and equipped somewhat after the fashion of a turbine wheel. The exhaust gas is thus taken into a rotor which not only harnesses this force and increases the power of the engine, but also very effectively muffles the explosions.


One of the Flywheels of This Stationary Gas Engine is Converted into a Turbine for the Utilization of the Exhaust Gases

It is claimed that the device can be used on most present types of engine.

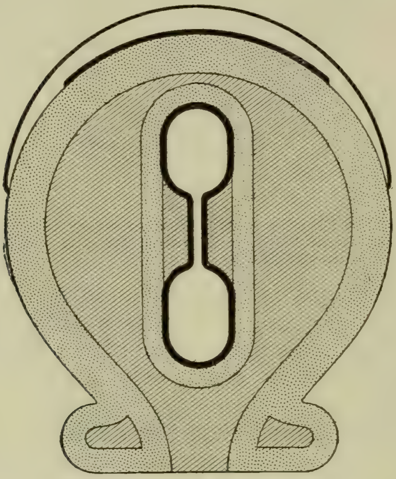
FOUR-FLAME LIGHTER FOR GAS STOVES

The flame from the lighter shown in this illustration, shooting in four directions, will ignite any one or all of the four burners of the gas stove, by simply turning the gas key connected with it. A small protected light burns continuously in the dome, and the turning of the key admits an extra supply of gas which is ignited and projected


A Gas-Stove Lighter Which Projects a Flame to All Four Burners

across to the four burners. The continuous burning of the small flame is claimed to consume no more than five cent's worth of gas per month.

VACUUM TIRE INSTEAD OF PNEUMATIC



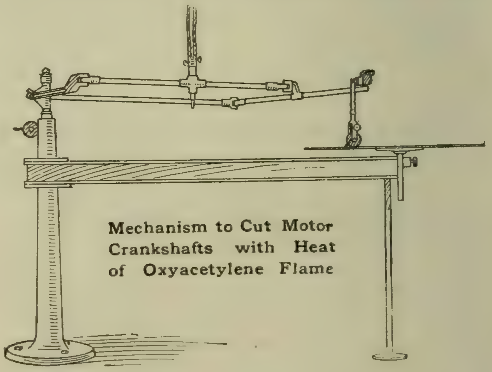
Cross Section of Vacuum Tire

The pneumatic-tire problem, which has persisted since the early "safety" bicycle period, is solved at last, if the Brooklyn inventor of a new and radical substitute may be believed. He has just placed his invention on the market. The contention of the Brooklyn man is that the elimination of air, in other substitutes for the pneumatic tire, limits the elasticity of the tire to the degree of elasticity possessed by the substance of which the tire is composed. It is evident, he says, that a tire which depends for its easy-riding qualities on the compressibility or extensibility of solids never can compete with the pneumatic, since air has no elastic limit.

With these principles in mind he evolved what he terms a single-tube, wrapped-tread, vacuum tire, a cross section of which is shown in the accompanying illustration, the innovation being that the air is pumped out from the interior instead of being compressed into it. The air chamber, or rather the vacuum chamber, for very little air remains after the pumping operation has been completed, is ½ in. wide by 2⅞ in. long when the tire is subjected to atmospheric pressure only. When the weight of the car is applied, however, the chamber tends to widen in the middle and this tendency is resisted by the pressure of the atmosphere which is exerted on the outside of the tire. Thus, according to the maker, the vacuum tire, like an ordinary pneumatic, depends for its resilience on air pressure, and yet blowouts are impossible, for the pressure is all external and the fabric is not strained. Punctures, although not impossible, need not necessarily occasion delay, for the tire is of sufficiently heavy construction to be used as a cushion tire.

PANTOGRAPH CUTS OUT CRANKSHAFTS

In the early days of the automobile industry the engine crankshafts were cut from thick steel plates at great cost. Cheaper engines became possible with the advent of drop-forged shafts. Recently, however, there has been a reversion to the old method of cutting the shafts from plates and this was made possible by means of the oxyacetylene process. Essentially this is a method of applying an intense flame and burning the crankshaft out of the steel plate.

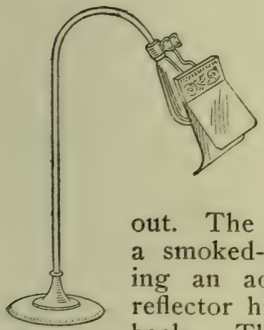


Mechanism to Cut Motor Crankshafts with Heat of Oxyacetylene Flame

An eastern firm has now come forward with a short-cut on this process and the prospects are for even less costly shafts. It attaches the oxyacetylene torch to a reducing pantograph, and dispenses entirely with the necessity of laying out the work on the steel plate. The pantograph consists of a frame standing on a pair of legs and supporting the work directly under the nozzle of a vertical torch. Elsewhere on the frame a table is fastened to support the flat blueprint which is twice as large as the shaft itself is to be. The pantograph arm, which is driven by an electric motor, extends over the table and the plate of 3-in. steel.

The operator merely turns on the motor and traces the blueprint. The torch thereupon eats its way along a similar, but smaller, path on the steel plate. It cuts curves and right angles with equal facility and will travel at the rate of 6 in. a minute.

FILTERING REFLECTOR FOR INCANDESCENT LAMPS



An ingenious means of directing full illumination on a certain piece of work or object, while the eyes are absolutely protected from any direct rays of light, is provided in a shade recently brought out. The shade consists of a smoked-glass shield having an adjustable metallic reflector hinged to it at the back. The shade is attached to the socket of an electric light by means of a spring clamp.

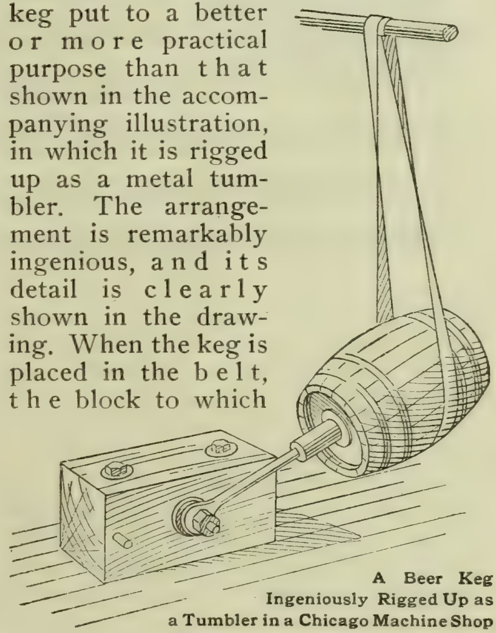
SAFETY PIN USED AS MAGNETO SWITCH

An exceptional use for a safety pin has been found by a motorcycle rider. The pin, which is of large size, is fastened to the handle bar by several windings of tape, and several layers underneath keep it from touching the handle. A wire is run from the pin to the magneto, and tape is wound around the top of the head of the pin to keep the rider of the machine from getting a shock when his thumb touches it. Pressing down the head of the pin so that it touches the handle bar short-circuits the current and kills the spark, thus stopping the engine.

Safety Pin as a Switch on Magneto Wires of a Motorcycle

BEER KEG USED AS METAL TUMBLER

The owner of a machine shop in Chicago insists that there never was a beer keg put to a better or more practical purpose than that shown in the accompanying illustration, in which it is rigged up as a metal tumbler. The arrangement is remarkably ingenious, and its detail is clearly shown in the drawing. When the keg is placed in the belt, the block to which the tumbler shaft is attached is moved forward and back, crosswise of the shaft, until the belt tracks fairly upon the keg, and is then fastened securely to the floor. By simply altering the belt, the angle of the keg may be changed from about the 30 deg. shown in the drawing to nearly 60 deg., without altering the block.

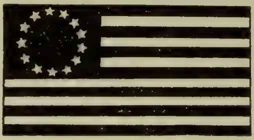


A Beer Keg Ingeniously Rigged Up as a Tumbler in a Chicago Machine Shop

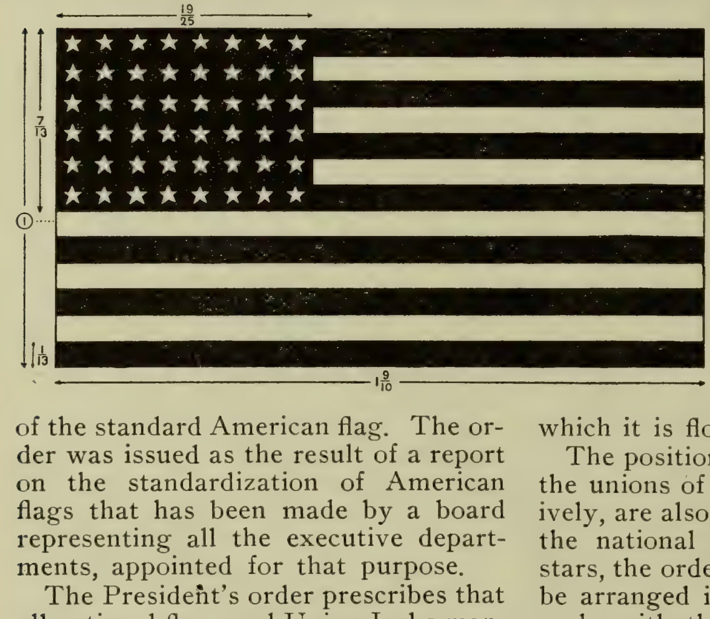
When it is desired to empty the keg, it is simply lifted from the belt and lowered to the floor or raised and swung backward.

FIXING A STANDARD FOR AMERICAN FLAGS

Because of the lack of uniformity in the proportions of the flags manufactured for the various government departments, the President has issued an order prescribing the requirements of the standard American flag. The order was issued as the result of a report on the standardization of American flags that has been made by a board representing all the executive departments, appointed for that purpose.



Flags Less Than Five Feet High Must Have Only 13 Stars, Arranged in Circle



All Official Flags must be Made According to the Proportions Given Here, the "Hoist" or Height of the Flag Being the Unit One

The President's order prescribes that all national flags and Union Jacks manufactured for the government departments, with the exception of the colors carried by troops, and camp colors, which are provided for in the regulations of the army and navy, shall conform to the following proportions: Hoist (width) of flag, 1; fly (length) of flag, 1.9; hoist (width) of union, 7/13; fly (length) of union, .76 or 19/25; width of each stripe, 1/13.

The order further provides the sizes of flags manufactured or purchased for the government departments shall be limited to those with the following hoists:

No. 1, 20 ft.; 2, 19 ft. (standard); 3, 14.35 ft.; 4, 12.19 ft.; 5, 10 ft.; 6, 8.94 ft.; 7, 5.14 ft.; 8, 5 ft.; 9, 3.52 ft.; 10, 2.90 ft.; 11, 2.37 ft.; 12, 1.31 ft.

When in the manufacture of any flag under these specifications the resulting dimensions appear as fractions of an inch, such fraction shall be taken as the nearer inch. In the event of a fraction of exactly a half inch, the whole inch greater shall be adopted.

The order provides that all national flags having hoists less than 5 ft., except colors carried by troops, and the corresponding Union Jacks, shall have only 13 stars in the union, in order that the identity of the stars may be plainly distinguishable. The size of the Union Jack shall be the size of the union of the national flag with which it is flown.

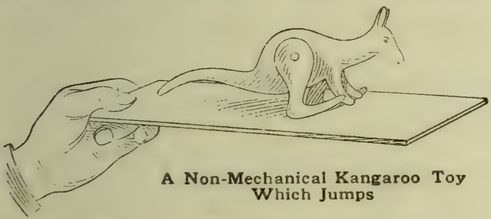
The position and size of each star for the unions of 48 and 13 stars, respectively, are also provided. In the case of the national flag which now has 48 stars, the order provides that they shall be arranged in six rows of eight stars each, with the corresponding stars in each row in a vertical line. The size of the stars in this type of flag is not determined by means of proportion but by a scale prepared by the Navy Department and supplied to the other executive departments. It prescribes that the diameter of a circle the circumference of which will intersect the five points of the star shall be 1.17 ft. in the case of the flag of type No. 2; .92 ft. in the case of flag No. 3; .83 ft. in the case of flag No. 4; .67 ft. in the case of flag No. 6; .42 ft. in the case of flag No. 7, etc.

All flags used by the government are now being made to conform to the new regulations.

JUMPING KANGAROO IS INGENIOUS TOY

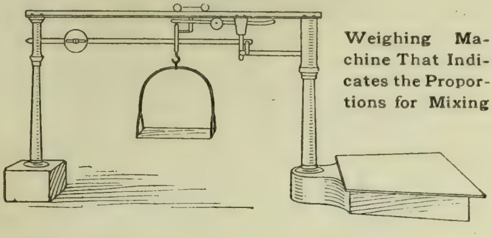
A toy kangaroo which jumps when placed on a slightly inclined board, table or other surface, but which is not provided with springs or mechanical motive power of any kind, is the latest toy to please the fancy of Parisian boys and girls.

The motive power of the interesting toy is derived through the construction of the hind legs and the arrangement of the center of gravity of the body. When the toy rests on a horizontal board it is supported by the tail and the bends of the hind legs, but when the board is gently tipped the center of gravity of the body changes, the toy leans forward until only the lower part of the hind legs are resting on the board. Then the momentum of the body causes the kangaroo to make a jump, bringing it back into its original position on the tail and bends of the hind legs again. The shock resulting from the completion of the jump throws the body forward again and the jump is repeated, and so on.


A Non-Mechanical Kangaroo Toy Which Jumps

SCALE TELLS PROPORTIONS FOR MIXING

The latest means of quickly solving the problem of mixing so many parts of one substance with so many of another—as in the making of cement—is a weighing machine which calculates in percentages. A hopper containing the more bulky material is placed on a stationary platform and a bucket is set on a swinging platform. After they have been balanced on their respective steelyards by poises, a runner carries the swinging platform along the frame until an indicator points to the percentage desired. Then the hopper is filled and afterward the bucket on the swinging platform is supplied with the smaller ingredient of the mixture until the scales balance. The machine is said to save much time and to prevent errors effectively.

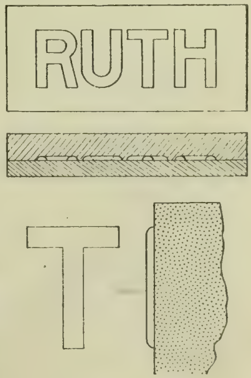

Weighing Machine That Indicates the Proportions for Mixing

SILENT WINCHES FOR STEAMSHIPS

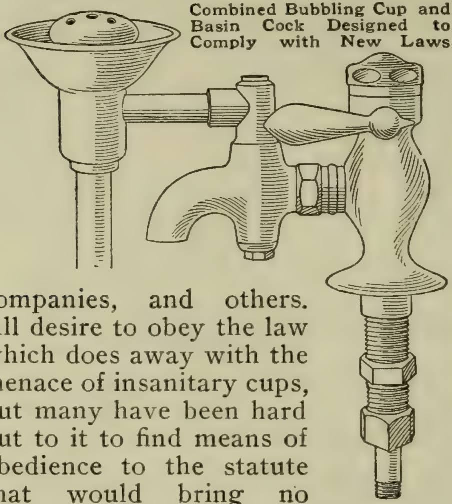
The racking winch noises so common when cargo is being handled on board ship are slowly but surely becoming a nuisance of the past. Many steamship lines have already adopted a chain-driven noiseless winch, and a concern which has been very successful in the production of such winches is now introducing silent electric winches with lifting powers up to seven tons.

TOMBSTONES WITH GLASS LETTERING

An Indiana man has invented a process of placing glass letters upon tombstones. The letters, which have a convex exterior surface and a concave interior, are first laid on a plate of clay or wax. From this an impression is taken on a plaster-of-Paris matrix. This is planed to permit the desired portion of the letters to project. Concrete is then tamped into this matrix and the form placed on the stone.



BUBBLING CUP COMBINED WITH FAUCET



Combined Bubbling Cup and Basin Cock Designed to Comply with New Laws

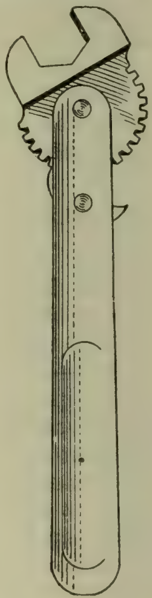
Laws compelling the abolishment of the public drinking cup have brought perplexity to building owners, railroad companies, and others. All desire to obey the law which does away with the menace of insanitary cups, but many have been hard put to it to find means of obedience to the statute that would bring no offense to tenants, passengers, or patrons of various sorts. Some have installed paper cups, available to the thirsty person who is willing to pay one cent for the privilege, but many dry ones have resented the pay-before-you-drink proposition. Ordinary bubbling cups solved the problem only in part as they were impracticable for lavatory washing purposes. A Chicago concern now declares it has found a solution to the difficulty in the combination bubbling cup and basin cock shown in the accompanying illustration. The claims made for the new device are that it complies with the law, is self-closing and economical in the use of water, gives a solid conical bubble, a full stream from the spout, and does not interfere in any way with a person washing.

"ARGENTAL" COMPETES WITH SILVER

After experimentation covering several years a new metal, called "argental," has been evolved, which is composed of silver and aluminum. It is obtained by employing chemicals and rare metals to produce the essential "affinity" between the silver and the aluminum.

In a manufacturing and industrial way the new metal may become a substitute for silver, the claim being made that the new metal is in many ways superior to the ancient white metal. Its strength is said to be many times that of silver or aluminum alone. In color it partakes more of the nature of silver than of aluminum, which will prove an advantage. The alloy is proof against deterioration from the action of ordinary acids, and it will not tarnish or oxidize by exposure to atmosphere or gases. Its specific gravity is only one-third that of silver, which will permit the manufacture of three or four times the quantity of articles from it as from an equal weight of silver. The new metal also readily lends itself to the various manufacturing methods employed in working silver and is susceptible of a high polish.

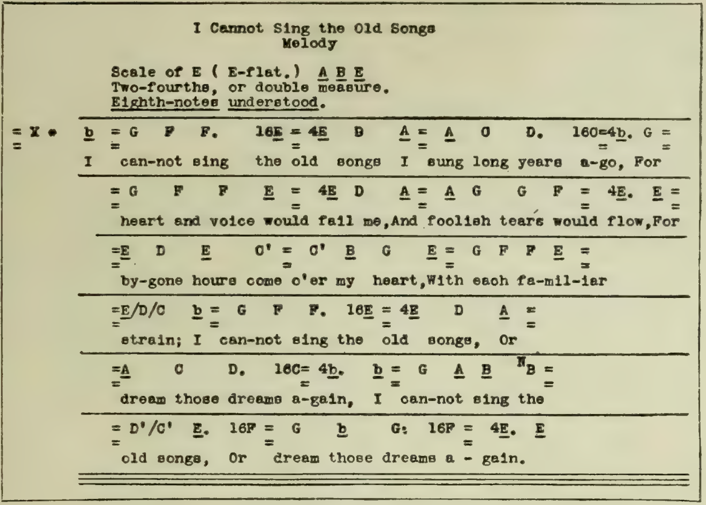
ADJUSTABLE RATCHET WRENCH



A reversible ratchet wrench, which is easily operated, is shown in the accompanying sketch. An advantage found in operating the wrench is that it may be reversed without turning the wrench over. A turn of the pawl with the thumb is all that is required to do this. The manufacturers make the claim that this wrench is adjustable to 16 different angles. Jaws or nut holders of various sizes, but, of course, interchangeable in the handle, are provided. It is possible with this wrench squarely to engage a thin nut on a flat surface, as the jaws are widened in front so as to come flush with the cheeks of the handle. The handle is offset on one side.

MAKING MUSIC WITH AN ORDINARY TYPEWRITER

A method of writing music on a typewriter or printing it with the type of an ordinary type case, and still having it sufficiently clear so that it can readily be played after a little practice, has been worked out by Clarence G. Gates of Tuscola, Ill. He has found it possible to quickly copy on a typewriter any music in this manner, and for illustration wrote a familiar melody, as shown in the accompanying illustration.



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                    I Cannot Sing the Old Songs
                              Melody

          Scale of E ( E-flat.)  A B E
          Two-fourths, or double measure.
          Eighth-notes understood.
        ____________________________________________________________
= X *   b  = G   F   F.    16E = 4E   D    A =  A    C    D.   16C=4b. G =
=          =                   =           =                      =      =
        I   can-not sing   the old  songs  I  sung long years  a-go, For
        ____________________________________________________________
           = G    F    F    E  =  4E  D    A =  A  G    G   F  =  4E.  E =
           =                   =           =                   =       =
            heart and voice would fail me,And foolish tears would flow,For
          __________________________________________________________
           =E   D    E     C' =  C'  B   G    E =  G  F  F  E  =
           =                  =               =             =
            by-gone hours come o'er my  heart,With each fa-mil-iar
        ____________________________________________________________
           =E/D/C   b =  G   F   F.  16E = 4E    D    A  =
           =          =                  =            =
            strain; I  can-not sing the  old  songs,  Or
        ____________________________________________________________
           =A     C     D.   16C= 4b.   b =  G   A  B   NB =
           =                    =         =             =
            dream those dreams a-gain,  I  can-not sing the
        ____________________________________________________________
           = D'/C'  E.  16F =  G    b     G:  16F =  4E.  E
           =                =                     =
            old songs,  Or   dream those dreams a - gain.
        ============================================================
```

Reproduction of Music and Words of Familiar Song, Written on a Typewriter

The keys of a piano furnish the basis of the system, each key being represented by a fixed symbol of letters with accompanying characters. In detail, the system is as follows:

All white keys above middle C are indicated by capital letters.

All white keys below middle C are indicated by small letters.

Fourth octave above middle C: C‴ D‴ E‴ F‴ G‴ A‴ B‴ (three-prime.)

Third octave above middle C: C″ D″ E″ F″ G″ A″ B″ (two-prime.)

Second octave above middle C: C′ D′ E′ F′ G′ A′ B′ (prime.)

First octave above middle C: C D E F G A B

First octave below middle C: c b a g f e d

Second octave below middle C: c′ b′ a′ g′ f′ e′ d′ (prime.)

Third octave below middle C: c″ b″ a″ g″ f″ e″ d″ (two-prime.)

Fourth octave below middle C: c‴ b‴ a‴ g‴ f‴ e‴ d‴ (three-prime.)

C and c are the same note, middle C, and it is the only note indicated by two letters, as the primes of the letters in the first octave above and below, indicate different notes, or keys. Any letter underlined, is flatted. Any letter with dot or period above it, or the mark ʌ following it, is sharped.

Whole notes, half notes, quarter notes, eighth notes, and sixteenth notes, are, respectively, indicated by the numbers 1, 2, 4, 8, and 16 placed before any letter. Where there are more notes of one kind in a musical composition, the particular number indicating such notes may be omitted, when such phrases, as "quarter notes understood," or "eighth notes understood," are placed at the top of the piece.

The rests are:

Whole rest — Half rest ||

Quarter rest X Eighth rest *

A period after a note (letter) means the same as in ordinary music writing, that is, a half increase in the time of the note.

A tie is indicated by a plus sign, +

A slur is indicated by one or more / // placed between two or more letters.

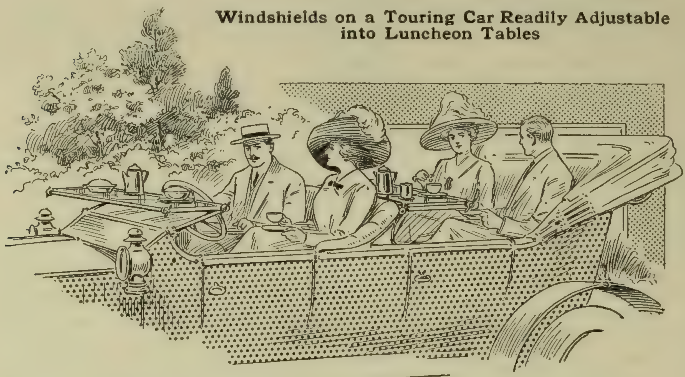
The natural is indicated by the capital letter N.

The bar of a measure is =
=

The method is widely adaptable.

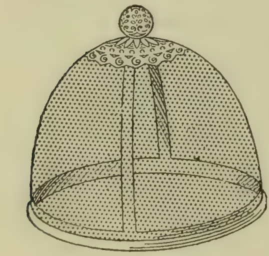
WINDSHIELDS CAN BE USED FOR TABLES

Windshields on a Touring Car Readily Adjustable into Luncheon Tables



Windshields which can be used for luncheon tables on a motor touring car are now being manufactured. The shields are provided for both the driver's seat and the tonneau, and are primarily intended to be so easy of adjustment for different wind conditions as to be at all times as unobtrusive as possible. This ready adjustment incidentally makes it possible to bend both shields over to a horizontal position, thus forming tables for luncheon.

SILVERED FLY SCREENS FOR DISHES



It is customary in France during the summer to protect dishes of fruit, pastry, and the like, from flies by placing bell jars of glass or metal over them. These devices, however, are rather too clumsy and inelegant to satisfy Parisian taste, and the glass and metal bells are now giving way to bells of fine wire screen, in silver, nickeled steel, etc., with elaborately ornamented tops.

These protectors are called in French "para-mouche," literally "para-fly," just as the word "parasol" means sun protector.

GENERATING PLANTS FOR OLD ELECTRIC TRUCKS

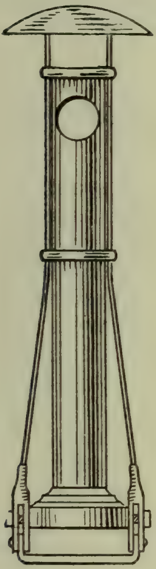
One of the large national express companies, on finding that it had a considerable number of electric motor trucks which had apparently outworn their usefulness, decided to attempt a rejuvenation, rather than scrap the machines or sell them for a song. The rejuvenation was effected by discarding the batteries altogether and installing in their place power plants consisting of a small gasoline motor direct-connected to a direct-current generator. It is claimed that the capacity of these outfits is sufficient for all the ordinary requirements of the work done by the vehicles.

In the first experiments the engine and generator were installed directly on the battery bed, the old controller was used, and the current from the generator was carried to it just as was the current from the battery, and then to the motor or motors. Later installations were more elaborate and powerful.

WATER BUGS THRIVE ON POSTAGE STAMPS

Postmaster-General Hitchcock is casting about for some means to curb the voracious appetite of water bugs for the gum on the backs of postage stamps. Occasionally complaints are received at the Post Office Department in Washington that stamps do not stick to envelopes. The reason almost always is that the greater part, if not all, of the gum on the backs has been eaten off by these bugs. Thus far it has been an unsolvable question how to stop this. Mr. Hitchcock has given the strictest orders that no poison of any kind tending to kill or drive away the bugs be put in the gum. He considers it better that a part of the stamps go gumless than that any person run the risk of being poisoned from moistening the backs of stamps. Nor is any bug poison permitted to be placed near the stamps for the same reason. Of course, every effort is made to keep down the number of the pests, but it is well known that they swarm to places where there are paper, paste and mucilage, the dainties of which they are most fond.

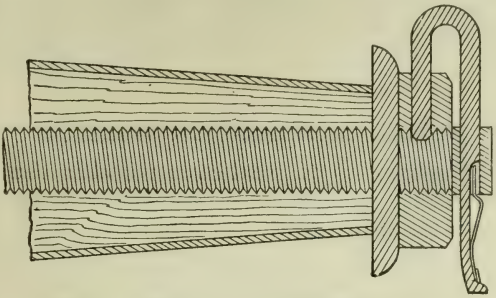
NOZZLE THROWS STREAM AT RIGHT ANGLES



A new fire nozzle has made its appearance designed for the purpose of throwing a stream of water at a right angle or also in a cone toward rear of the discharge. At the mouth of the nozzle is a concave baffle plate held out from the discharge point a few inches by sliding rods. When this is forced down through a burning floor a stream of water can be thrown up against the ceiling below by the firemen. If the joist and lathing in the ceiling below are burning, the baffle is pulled back and closed. This throws a stream of water through a hole in the side of the nozzle at a right angle and in behind the burning joist.

NUT-LOCKING DEVICE FOR WAGON AXLE

Accidents resulting from a nut dropping off the wooden axle of a wagon may be avoided by the use of the lock nut outlined in the accompanying sketch, which shows a section of axle with the nut in place and locked. A recess drilled into the thread receives the locking pin which passes through the nut and also through the head of the bolt which carries the nut. A small spring holds the pin in place and the latter is protected by the hub which extends beyond it. In the drawing the hub does not appear. There is nothing complicated in the device and the makers assert that an hour's work by one man is sufficient to attach a set of locks to a wagon.

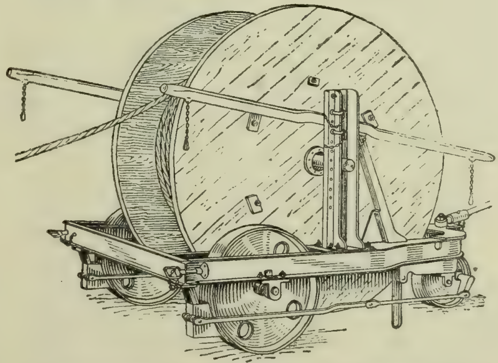


Nut Lock Which may be Readily Attached to Wooden Axle of Wagon

THREE-WHEELED TRUCK FOR CABLE DRUMS

The drums upon which electric cables are wound are of such great size and weight that special wagons or trucks are required to transport them. These are generally four-wheeled steel trucks with a low floor and two inclined channel beams at the ends over which the drums can be pushed, but a new type of truck for such purposes has recently been turned out by a German firm.

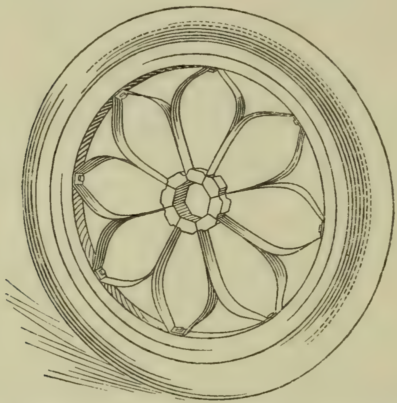
This truck comprises a heavy U-shaped frame, the open end of which is provided with a removable crossbar, while, at either side, rises a steel



An Ingenious Three-Wheeled Truck Designed for the Transportation of Cable Drums post provided with a slot in which the spindle of the drum may be moved up and down. The frame is carried on three wheels. When a drum is to be transported by this truck, the cross-bar is removed and the truck is pushed backward until the drum is inclosed by it, the bar is replaced and bolted, and the drum is raised from the ground by operating the levers.

STEEL MOTOR-CAR WHEEL

Superiority of steel over wood is the "talking point" most emphasized by the manufacturers of the steel automobile wheel shown in the accompanying illustration. Strength of from two to five times that of a wooden wheel of the same weight is claimed for the steel wheel, and it is so simple in construction that it may be dismounted and any of the parts easily replaced. The natural spring of the steel is an advantage as it imparts some degree of resiliency, making the new-style wheel particularly useful on electric vehicles which ordinarily are equipped with solid or cushion tires.


Steel Wheel Showing Construction and Facility of Replacing Parts

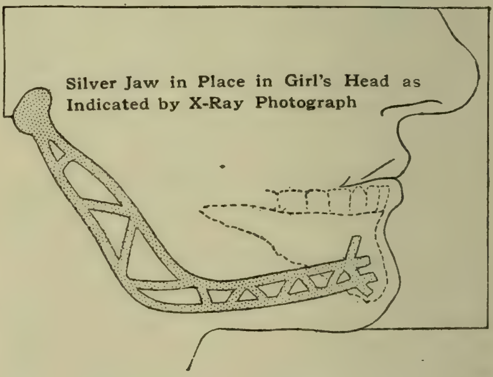
CITY GARBAGE UTILIZED IN STREET LIGHTING

The garbage and other refuse of Minneapolis, Minn., is being utilized to generate current for 200 street-illumination arc lamps, the health department, which collects the garbage and refuse and operates the incinerator, being paid $5 per street lamp less than the city pays the lighting company.

Most of the garbage gathered from Minneapolis homes is drained by the householders, at the request of the health department, then wrapped up in paper and placed in covered cans. Combustible trade refuse is brought to the furnace at private expense. The draining and wrapping of the garbage increases its combustible value to a considerable extent, as well as helping keep the cans clean and making once-a-week collection in the residence districts satisfactory even in the summer time.

GIRL HAS A SILVER "JAWBONE"

That a silver "jawbone" is practical and efficient has been proven after a thorough test in the case of a patient of a Chicago physician. A sarcoma, a form of cancer, had attacked the lower jaw in a girl of eleven, destroying a portion of it and threatening death in a short time. The surgeon removed half of the jawbone on the diseased side and inserted a silver framework shaped somewhat like the bone, having a large knob similar to the joint end of the natural bone, for articulation with the bones of the skull. The other end of the frame was inserted for one-third of an inch into the healthy


Silver Jaw in Place in Girl's Head as Indicated by X-Ray Photograph

portion of the jawbone and then the soft tissues were sutured around the framework.

After some little trouble perfect healing had taken place, and the patient, now, after a test long enough to satisfy the surgeons, has a serviceable lower jaw, half natural and half silver, with scarcely any external evidence of her unusual possession except a slight lack of symmetry in the two sides of the face. A bridge even supplies the missing natural teeth on that side. The illustration, reproduced from the Journal of the American Medical Association, shows the framework in place, as revealed by the X-ray.

FIGHTS LOCUST PLAGUE WITH EPIDEMIC

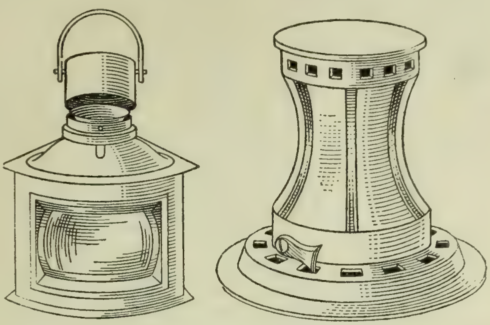
Great success has been met with by M. Felix d'Herelle, a young French physician, in fighting the locust plague in Argentina. During a visit to Mexico two years ago, the physician observed an epidemic among the locusts there and, after prolonged research, succeeded in discovering the bacillus of the disease. He decided that the best means of combating the insect would be to spread this disease among them, and the Argentine government invited him to make a practical test of the idea.

His first experiments were successful. A column of locusts kept between barriers for observation purposes, were exterminated six days after they had eaten grass sprinkled with a preparation containing cultures of the bacillus. Further tests showed that the infected insects spread the disease over great distances in a very short time, dead locusts being found 30 miles from the infected fields. Forty days after the test, locusts bearing the characteristic marks of the epidemic were found 250 miles from the infected area.

The French physician declares that his preparation is harmful only to the locust, the cattle and flocks grazing on fields sprinkled with it suffering no ill effects.

USEFUL YACHTING SOUVENIRS

Yachting souvenirs and novelties which have a practical as well as ornamental value, comprising compass-sundial paperweights, bollard inkstands, capstan inkstands and cigar lighters, ventilator pepper boxes, and the like, made their appearance during the yachting season. Two of the novelties are shown in the illustrations, one being a solid-silver yacht side light made both as an inkstand and as a cigar lighter, and a solid-silver capstan cigar lighter. The capstan is also made up in the form of an inkstand and pepper box.

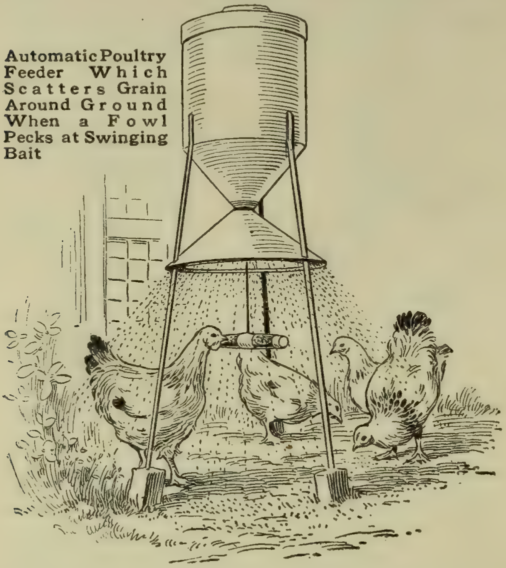


Silver Inkstands and Cigar Lighters Made in the Shapes of Side Lights and Capstans

PECKING AT BAIT BRINGS SHOWER OF GRAIN

A newly invented type of automatic poultry feeder depends upon the same principle that is used in baiting a trap, for this feeder has a bait that is pecked by the hungry fowls and, in response, the machine lets a shower of grain fall on the ground, which they devour.

The machine consists of a galvanized-iron supply fount filled with grain and a revolving toothed wheel at the base of it. This wheel is mounted on very delicate bearings which admit of its movement at the slightest touch. Attached to the wheel is a shaft which supports the bait. The bait consists of a hollow tube of wire netting containing wheat. The fowls see the wheat through the netting and peck at it, causing the toothed wheel to revolve and throw out grain from the top supply fount which falls on the lower metal cone and is scattered over the ground almost as efficiently as by hand. This prevents the fowls from gorging themselves.

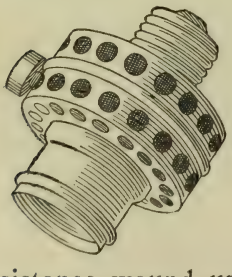


Automatic Poultry Feeder Which Scatters Grain Around Ground When a Fowl Pecks at Swinging Bait

After the feeder has been in use for a time there is no great rush by the fowls to peck the bait as one would imagine. Some fowls, the "wise" ones, wait around in a circle where the grain will be thrown and the one which pecks the grain usually gets very little of it.

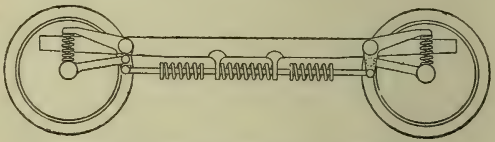
SOCKET REGULATOR FOR INCANDESCENT LAMP

A new form of regulator for incandescent electric lamps is shown in the illustration. It is a small compact attachment to be inserted between the lamp and the socket and the quantity of light is regulated by means of a small screw. The feature of the device is a wire resistance wound upon a bobbin across which a contact is made by a brass spring on the end of the screw shaft. The resistance is contained within a ventilated brass casing and the device is made of heavy stampings in order to give it the necessary rigidity. The regulator is manufactured in several assortments of brasses and bronzes to match different kinds of electrical fixtures.



NEW SPRING SUSPENSION FOR MOTOR CARS

An automobile spring-suspension system of a radical type is being demonstrated by a West Melbourne (Australia) inventor. Not only is the arrangement of springs and levers somewhat startling, but the results of the tests made have been such as to call forth favorable comment from experts. As shown in the accompanying illustration there is an entire absence of leaf springs in the system, all the springs being of the spiral type and all working under compression. By virtue of the lever action, which for all its simple appearance is decidedly complex, the weight of the car is divided among the various springs. Not only is the downward tendency of the body, as when the car wheels drop into a hole, checked by the spring arrangement, but the rebound is caught, cushioned and absorbed. The system was recently tested out on a specially built car equipped with solid-rubber tires, and the value of the novel equipment demonstrated under unfavorable conditions.



Motor-Car Spring-Suspension System

ℭThe balloon "Uncle Sam" made a new record for elimination races July 27 and 28 in preparation for the international contest by drifting from Kansas City, Mo., to Manassas, Va., a distance of 925 miles in 36 hours.

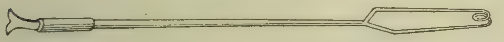
REMARKABLE BAGGAGE-SMASHING TEST

A trunk which is expected to thoroughly discourage baggage smashers was given a rather unusual test recently in Los Angeles. It was hoisted to the roof of a department store in the course of erection and dropped from a crane to an excavation below, a distance of 215 ft. The 68-lb. trunk hit the ground with great force, but, according to the claims made, was hardly dented, its condition being so good that it could be used for a trip around the world.

The trunk is constructed of thin veneers of hard wood with the grain running in various directions, this resulting in a very tough and light piece of luggage.

AN INTERLOCKING PACKING HOOK

A special hook said to be particularly effective in removing greased packing from around shafts and bearings, such, for instance, as out of the grease boxes on the axles of railroad rolling stock, is here shown. It is made of soft steel with hardened points, and by a slight twist and the slipping of the ferrule along the shank, the points form a loop through the packing, thus affording a secure hold in pulling out the packing.

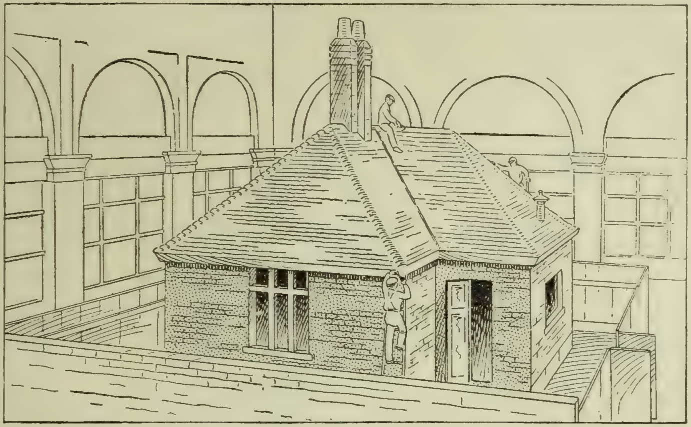


Simple Device for Readily Removing Greased Packing

ℭThe Navy Department of the United States has invited manufacturers to submit plans for the hydro-aeroplanes it is proposed to make part of the equipment of each battleship.

BRICK HOUSE INSIDE SCHOOL BUILDING

A complete brick house inside the big hall of a schoolroom has been erected by a dozen students of the London County Council School of Building. All the work on the structure was done by students, and it is the intention to remove the house outside and then use it for a students' club house. It is in the style of a Tudor cottage, with red-tiled roof. There is a breakfast room, dining room, bedroom and bathroom. Other students of the school are now making furniture for the house.



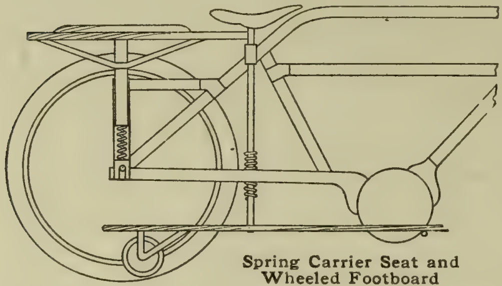
House Built by Students Inside a School

PUMPING WATER INTO CANAL

Water is supplied for the Canal d'Orleans in France by pumping it from the Loire River by means of what is termed a "canal regulator." The canal connects the Loire with the Loring Canal through which the lesser river finds outlet into the Seine. It formerly was fed by a number of small streams and 13 reservoirs, but the water derived from these sources was found inadequate for the traffic of the canal. The "regulator" lifts the water from the Loire River by means of electric pumps, operated by power obtained from a central station established for that purpose.

SPRING SEATS FOR MOTORCYCLES

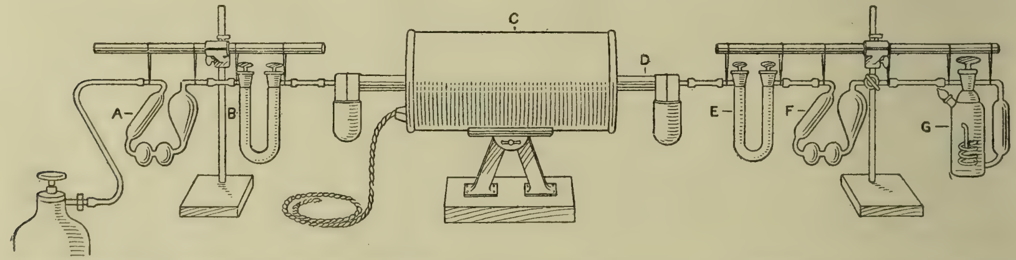
An English inventor has evolved the spring carrier seats and footboard attachment for motorcycles shown in the accompanying illustration. The side wheels, he declares, would prove a boon to learners and even to experienced riders who become nervous in heavy traffic. The devices are also recommended for the use of women riders. In the event of a skid the trailer side wheels would be brought into action.


Spring Carrier Seat and Wheeled Footboard

DETERMINING CARBON IN STEEL

An improved "combustion train," as is called the apparatus for determining the percentage of carbon in steel, has recently been perfected by a Philadelphia engineer. The steel to be tested is placed in the heating chamber of an electric furnace into which pure oxygen has been introduced. The carbon as well as the steel are thus burned or oxidized, the carbon combining with the pure oxygen to form carbon dioxide. The carbon-dioxide gas is then dried and purified in a series of glass tubes and bulbs, and finally passes into a collecting bottle where its weight is easily computed.

The advantage of this combustion train over other existing types is found in a double bulb which contains potash in certain form, with which the carbonic acid combines, making it possible to determine the amount of carbon by the increase in weight of the bulb. In this device, the bulb has so many improvements for controlling, handling, and increasing accuracy that the chemist may make more than 100 combustions without refilling the bulb.



Showing Electric Apparatus for Determination of Carbon in Steel: A and B, Purifying Tubes for Oxygen; C, Electric Combustion Chamber; D, Delivery Tube; E, Tube for Removing Impurities from Carbon Dioxide; F, Bulb for Removing Moisture from Carbon Dioxide; G, Double Potash Bulb for Absorbing Carbon Dioxide

THE NAMING OF LOCOMOTIVES

An amusing story having to do with the naming of locomotives was recently published in the "Berliner Tageblatt." At the meeting of the board of directors of a small local railroad in Germany the question of naming three new locomotives was discussed.

One director who was more or less of a joker proposed that the locomotives be named "Isolani," "Luther," and "Galileo," giving as his reason three famous sayings of these men. General Isolani (in Schiller's drama "Wallenstein") says "They are late to come, yet they arrive." Before the Reichstag at Worms Luther said "Here I stand and cannot otherwise." Galileo, after having retracted his, at the time, heretic belief that the earth moved around the sun, said, "And yet she moves."

EXAMINING THE BODY WITH SEARCHLIGHTS

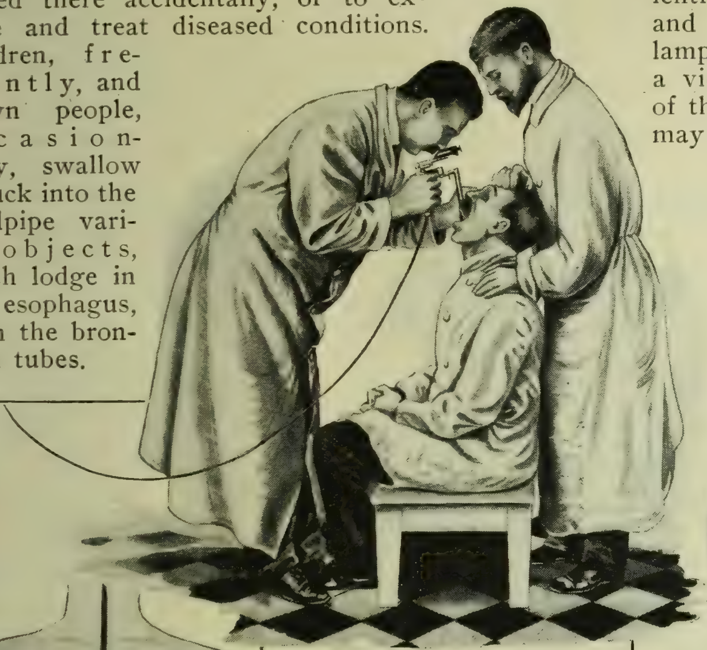
Inventive genius has now made it possible to look into nearly all the hollow organs of the body during life, to extract foreign bodies which have lodged there accidentally, or to explore and treat diseased conditions. Children, frequently, and grown people, occasionally, swallow or suck into the windpipe various objects, which lodge in the esophagus, or in the bronchial tubes.

The bronchoscope is a tube with a handle and mirror by means of which the surgeon can look down into the bronchial tubes and locate such foreign bodies, and by the aid of other appliances they may be grasped and removed. A similar instrument is used for locating objects which may have lodged in the esophagus, the passage to the stomach.

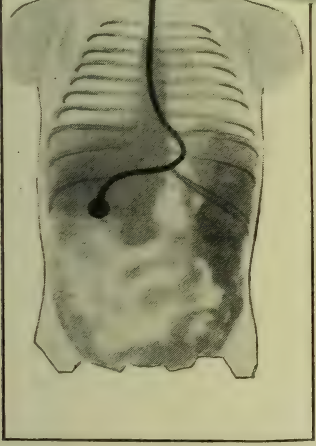
An improvement on this instrument enables the surgeon, through conveniently arranged mirrors and a small electric lamp at the end, to have a view of the interior of the stomach, and he may study the condition of the lining of that organ. The inside of the bladder may be explored in the same way.

The X-ray is also used for locating such foreign objects in the bronchial tubes or esophagus, and they may then be removed by forceps or other extractors under the guidance of the eye.

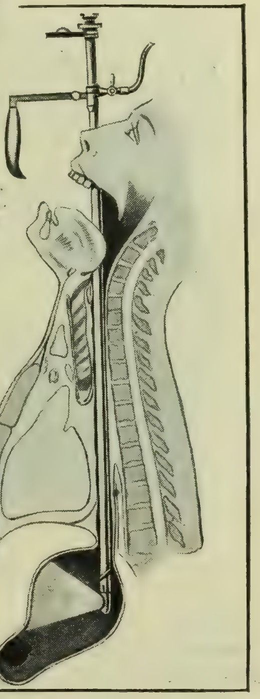
The tube for washing out the stomach has been used for a long time, but by means of a longer tube the



Method of Using the Bronchoscope When It is Desired to Locate a Foreign Body which has Become Lodged in One of the Bronchial Tubes



Left-Hand View—Tube with Ball at the End Used to Explore the Small Intestines. Radiograph of Actual Operation of the Instrument

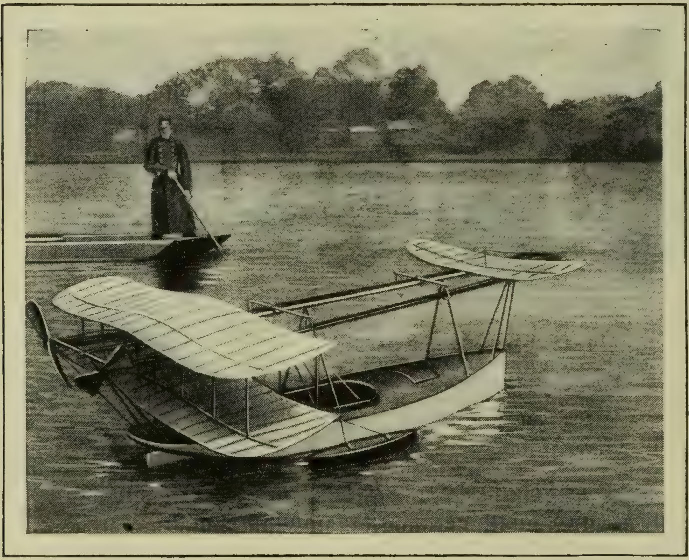


Right-Hand View—Sectional Drawing of the Upper Portion of a Human Body, Showing How the Surgical Searchlight is Used stomach may be passed and the duodenum, the first portion of the intestine, may also be explored. The radiograph shows this instrument with a metal ball on the end far down in the intestine. It is used to ascertain whether the passage from the stomach is free or constricted by disease, as sometimes happens. The same instrument is also used for feeding infants whose stomachs will retain no food. A small bucket on the end of a thread may also be passed through the tube and into the bowel, and the secretions of that portion of the digestive tube may be collected and withdrawn for examination.

By the use of these ingenious instruments much suffering is prevented, and many lives are saved.

HYDRO-AEROPLANE MODEL OF UNUSUAL SIZE

A model hydro-aeroplane which appears to be large enough for a regular aeroplane motor, but which is driven for a short distance by two exceptionally powerful rubber-band motors, is being used on one of the German rivers for testing the efficiency and stability of various kinds and shapes of planes. The little hydro-aeroplane consists of a small one-passenger boat fitted with planes. The rubber bands are stretched from end to end of the craft and are twisted up in the same manner as the small bands of a toy aeroplane.



Courtesy Aircraft

An Exceptionally Large Hydro-Aeroplane Model, Driven by Rubber Bands, Used in Germany for Testing Various Types of Planes

BORING CYLINDERS WITH AUTOMOBILE POWER

An unusual application of motor-car power in an emergency is related from Mississippi. A machine company at Jackson was recently called on to bore out the hydraulic water cylinders for a cotton compress at Yazoo City. The cylinders were 27 in. in diameter and made of cast steel. In order to do the work it became necessary to obtain power by some special means, as neither steam nor electric power were available at the cotton plant. The problem was solved by using a steam-power motor car. The engine was connected up with the boring bar by means of sprockets and chain. The time required to bore out the cylinders and packing grooves was 101 hours.

ℭChicago and Philadelphia are designated as the "laboratories and workshops" of America by a Frenchman who has recently visited the United States and spent two whole weeks "investigating" its customs and resources. He also referred to New York as the "hotel and restaurant" and Washington as the "salon" of the nation.

THE WONDERS OF LIGHT

VIII—What Eye Hath Not Seen

By
J. GORDON OGDEN, Ph. D.

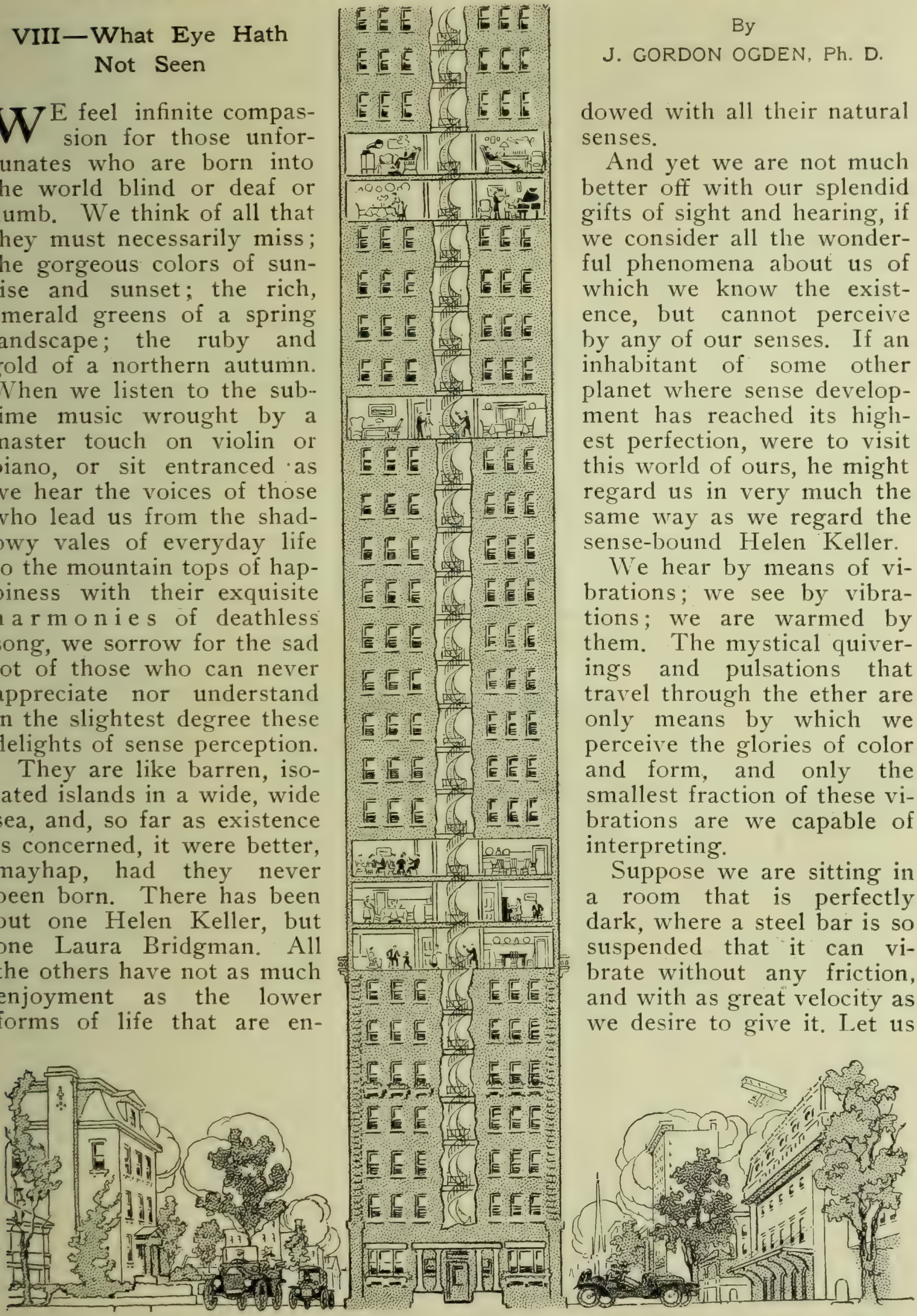
WE feel infinite compassion for those unfortunates who are born into the world blind or deaf or dumb. We think of all that they must necessarily miss; the gorgeous colors of sunrise and sunset; the rich, emerald greens of a spring landscape; the ruby and gold of a northern autumn. When we listen to the sublime music wrought by a master touch on violin or piano, or sit entranced as we hear the voices of those who lead us from the shadowy vales of everyday life to the mountain tops of happiness with their exquisite harmonies of deathless song, we sorrow for the sad lot of those who can never appreciate nor understand in the slightest degree these delights of sense perception.

They are like barren, isolated islands in a wide, wide sea, and, so far as existence is concerned, it were better, mayhap, had they never been born. There has been but one Helen Keller, but one Laura Bridgman. All the others have not as much enjoyment as the lower forms of life that are endowed with all their natural senses.

And yet we are not much better off with our splendid gifts of sight and hearing, if we consider all the wonderful phenomena about us of which we know the existence, but cannot perceive by any of our senses. If an inhabitant of some other planet where sense development has reached its highest perfection, were to visit this world of ours, he might regard us in very much the same way as we regard the sense-bound Helen Keller.

We hear by means of vibrations; we see by vibrations; we are warmed by them. The mystical quiverings and pulsations that travel through the ether are only means by which we perceive the glories of color and form, and only the smallest fraction of these vibrations are we capable of interpreting.

Suppose we are sitting in a room that is perfectly dark, where a steel bar is so suspended that it can vibrate without any friction, and with as great velocity as we desire to give it. Let us



The Mysterious Rooms Which are Locked to Human Senses. Dr. Ogden Describes the Vibrations of All Speeds, and These may be Compared to the Various Floors of a Skyscraper Apartment House, in Which the Only Apartments Open to Human Perception are the Ones Called Sound, Heat and Light, While the Intermediate Apartments are Those to Which Science is Striving to Gain Entrance.

start the bar spinning on its axis. We hear nothing, see nothing, until the bar beats the air 16 times in a second; then we become conscious of a deep, humming sound, the lowest that may be heard by human ears. We increase the rate to 17 vibrations and the pitch rises; then on to 32, when we hear the octave of the first sound; then on and on, doubling the rate each time, passing through the various octaves, and the pitch is ever rising. Finally when it is vibrating at the rate of about 40,000 per second, the sound is a shrill, ear-splitting shriek, so piercing and so high-pitched, that it actually pains us to hear it. Then increase the rate a few vibrations. The sound ceases absolutely, although the bar is still vibrating. We have passed beyond the limits of human perception of sound waves. Then speed up the bar; fifty thousand, sixty thousand, a hundred thousand, five hundred thousand, a million vibrations per second. Still no perception of anything that is coming from the bar. Faster and faster! Ten million, a hundred million, a billion! Still no perception of the frightful beating of ether waves, through any of our senses. An almost incalculable number of ether waves of different lengths have hammered upon us, like the waves of a mighty ocean against a rock cliff, but they have not affected us, so far as we know, in the slightest degree.

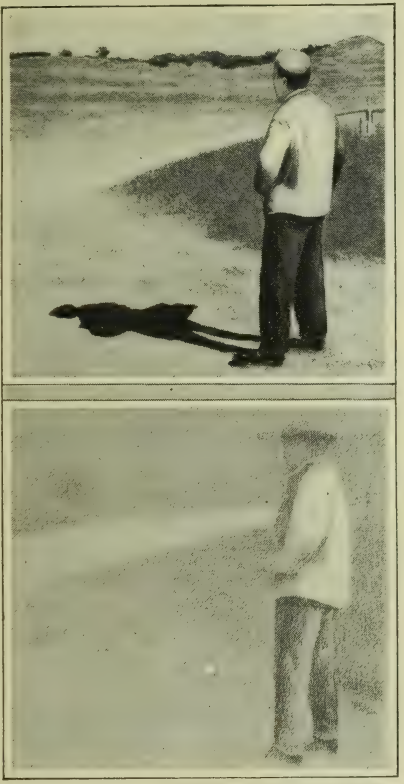
Up into the trillions, then, runs this ether-beating bar, and then we begin to perceive that something out of the ordinary is happening. From the bar there comes to us an agreeable warmth; it is now sending us vibrations which we interpret as heat. Then faster and still faster whirls the bar of steel, and as soon as it attains the rate of about 400 trillions per second, the bar begins to glow with a dull, red light. Increase the rate to 440 trillions, and the red fades into orange. As we increase the speed, the colors change successively to yellow, green, blue, and finally, at about twice the rate at which the red was produced, the bar becomes beautifully violet in color. Then if we still persist in greater speed, the colors die away, and the bar whirls on in absolute darkness, giving vibrations of still shorter wave lengths, but which we are unable to perceive with any of our sense organs. There can hardly be any doubt that all these different rates of vibration mean something, if we had the necessary sense acuteness to perceive them. Yet we are as blind and deaf to them as Helen Keller and all other like unfortunates are to ordinary light and sound.

Suppose that this earth of ours, whose area in round numbers is about 197,000,000 square miles, had no civilized human inhabitants except on a plot of ground, 10 miles square, in the center of a vast prairie, and that we, the dwellers on this fair-sized farm, had never ventured beyond this area. Suppose that nothing whatever was known of the balance of the globe. We could not claim to know much of the earth on which we dwell, and if we attempted to write a detailed description of the earth from what we perceived in our limited area, we would necessarily have to omit the most wonderful things on this planet of ours. We would know nothing of mighty oceans, of stupendous mountain ranges, broad rivers, immense canyons, beautiful lakes, roaring cataracts, cloud-crested volcanoes, the strange peoples, and the myriad forms of life that exist elsewhere on this globe. We would know only the comparatively few things that come within the range of one who is limited to such a "cabined, cribbed and confined" area.

And so is it with our sense perception. Out of all the innumerable trillions and quadrillions of vibrations that beat upon us in our everyday lives, we perceive just a few quiverings of the ether, and interpret them as heat or light, and all the others that may be as varied and as different in their effects, as light is different from heat, and heat from sound, are absolutely unperceived by us. Truly we are not so far from being Helen Kellers after all!

As Tyndall has said: "The domain of the senses in nature is almost infinitely small in comparison with the vast region accessible to thought which lies beyond them. From a few observations of a comet when it comes within range of his telescope, an astronomer can calculate its path in regions which no telescope can reach; and in like manner, by means of data furnished in the narrow world of the senses, we make ourselves at home in other and wider worlds, which are traversed by the intellect alone."

We have all gloried in the wonderful blending of colors as seen when the sun is setting in conditions favorable for a chromatic display; but if our eyes were sensitive to the vibrations above and below the spectrum limits, what marvels would they reveal, and what unspeakable harmonies of radiance would thrill our very souls! Were our eyes sensitive to "heat" waves, we could see perfectly well in an absolutely "dark" room, if there were a hot stove in the room. We could use thin, hard rubber windows and see through them as we see through transparent glass. We could use spectacles and telescopes whose lenses were of thin rubber!



Courtesy Illus. London News

Fig. 1—Photograph Taken under Usual Conditions, and Showing the Man's Shadow

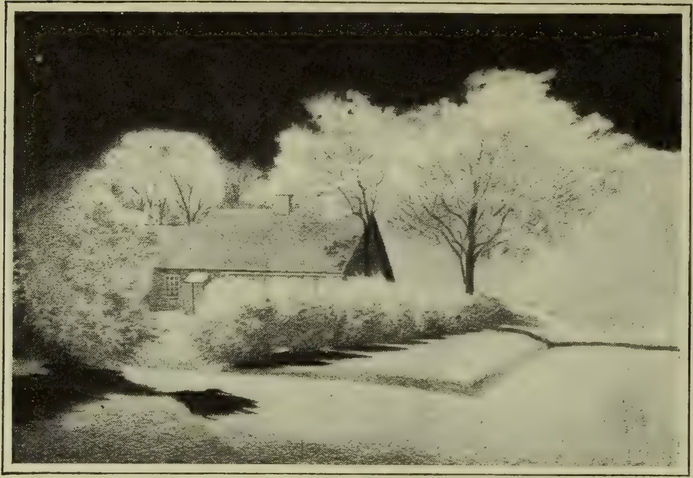
Fig. 2—Photograph Taken by Ultraviolet Rays at Same Time as Fig. 1, in Which Shadow is Not Present

Suppose we could look deeply into matter and see the wonderful dance of atoms and electrons which go to make up "matter," and perceive these infinitely small particles, if particles they are, moving with a velocity of 60,000 miles per second. Every wire carrying a current of electricity would be a source of delight to us; we could see the mysterious "lines of force" of Faraday whirling around in a dizzy dance about the poles of a common magnet.

If, on the other hand, we could go to the other extreme of the spectrum and see the tiny waves, less than 1/64,000 of an inch in length, that are known as the ultraviolet, how wonderful it would be! Although these ultraviolet waves do not stimulate our optic nerves, they will affect a photographic plate. Figure 2 is a picture of a man taken in full sunlight by means of these wonderful rays. The lens used was made of pure quartz, as glass is opaque to these smaller ether waves. The lens was also covered with a thin film of pure silver, which is opaque to ordinary sunlight but quite transparent to the ultraviolet radiations.

These tiny violet waves have a very important function in our vital economy. They are the chemists of the invisible world and are the real agents by which a plant is enabled to transmute water and the poisonous carbon-dioxide gas into valuable foods, such as sugar and starch. They are also used by the physician in the treatment of cancer. Many forms of skin disease readily succumb to their action. They are like tiny little hammers which break down many chemical compounds, such as the salts of silver when emulsified with collodion or other organic substance. This is the basis of modern photography as will be explained in a succeeding chapter. They hammer upon certain of the chemical compounds in the skin, and it is not the seashore nor the wind, but the ultraviolet rays that bring about the "beautiful coat of tan" so much sought for in these days of athletic trend.

Figure 3 is a photograph made by means of the infra-red rays,—waves that are too long to excite vision. The lens was screened by a dense cobalt glass, and also by a filter made of a strong solution of bichromate of potassium, which combination eliminates the visible light, and allows only the infra-red rays to reach the sensitized plate. These remarkable photographs taken by means of either the ultraviolet or the infra-red waves, show us how the world would appear were our vision limited to these rates of vibration.



Courtesy Illus. London News

Fig. 3—Photograph Made in Full Sunlight by the Invisible Infra-Red Rays

Electricity, heat, and light are forms of the same kind of ether wave motion. They differ only in the length of waves. The shortest light waves are about 1/64,000 of an inch. The shortest heat waves are about 1/30,000 of an inch, known as "dark" heat waves, the longer ones, a few thousandths of an inch in length are "radiant heat," while electrical waves vary in length from the tenth of an inch to over one mile. Marconi when he sent his first signal across the Atlantic, used waves about 600 ft. in length, while the Calcutta physician, Jagodis Chunder Bose, the first man to send a wireless message, used waves that were only one-tenth of an inch long.

Wonderful indeed are these ether waves, whether they come to us from the stars shining in the far firmament of the heavens; from the electric wires of dynamo, telegraph, or telephone, that crisscross our cities in every direction; from the motors whirring under the floor of street cars; from the trolley wire overhead, or from the fireplaces in our comfortable homes. All of them send forth their marvelous quiverings that beat upon us, are reflected from our bodies, or else riddle us through and through, as though we were naught but thin, transparent air. And what a wonderful thing it would be were we able to perceive all that is happening on our crowded streets, filled with the intricate tangles of these mysterious vibrations, that come to us from every direction, and with every conceivable rate of speed. How do they affect us, and will there be any permanent change brought about in the intellectual or physical make up of our descendants, produced by the incessant hammering of these tiny little ether projectiles.

All of these waves—light, heat, and electric—travel at the same enormous velocity of over 186,000 miles per second. Light waves pass readily through glass, heat waves through rubber, and electric waves seem to have no trouble in passing through mountains and houses, and are stopped only by metal. The ultraviolet waves, as we have seen, pass with ease through solid silver.

Light waves have a remarkable effect upon the element known as selenium. This substance is a good conductor of electricity, but its conductivity increases when light is thrown upon it, and decreases when the light waves are withheld. Hence it is used in the construction of an apparatus known as a photophone. One form consists of a thin mirror of silvered mica which receives sound vibrations, and upon which light waves fall at the same time. This light is reflected to a concave mirror at a distance, and is brought to a focus upon a selenium cell connected with a telephone that reproduces the spoken word. Light may therefore be used as a medium for the transfer of oral messages.

It is possible to render visible some of the invisible light waves known as the ultraviolet. These waves may be likened to race horses that travel so fast that they are invisible. If we handicap these horses so that they are compelled to travel more slowly, they come within the range of our vision. Ultraviolet light, otherwise absolutely invisible, when passed through a solution of horse-chestnut bark, or of quinine, has its wave length increased, and becomes visible. This phenomenon of light is known as fluorescence. The delicate blue color of coal oil is due to this principle. It may also be observed on the surface of certain minerals, such as fluorspar, and the yellowish-green surface color of glass colored with the oxide of uranium is a phenomenon that is also due to fluorescence.

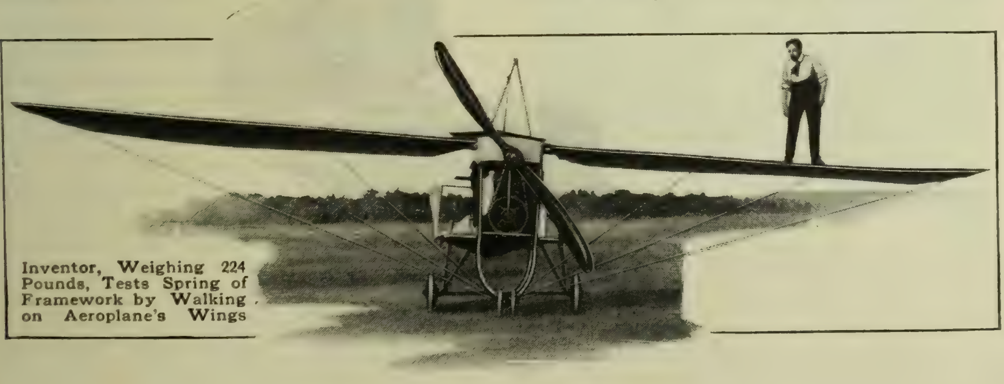
Light waves that are just a trifle too long to be visible, may be transformed into more rapid ones. If a beam of light is passed through a solution of iodine in carbon bisulphide, the visible rays are quenched, but the long, infra-red rays pass on. If these rays are focused by means of a lens upon a strip of platinum foil, the platinum will become luminous, and the light therefrom gives a continuous spectrum when examined with a spectroscope. This shortening of wave lengths is known as calorescence.

And yet, all of these wonderful ultraviolet and infra-red rays are only a few of the waves that some day may be known to us. What other waves are in the vast gap between sound, electricity, and heat, between heat and light, and in the interminable abyss beyond light? Mayhap we shall know more about them fifty years, even ten years, from now. Who knows?

CODY'S "FAMILY-BUILT" AEROPLANE

The monoplane shown in the accompanying illustration is the product of the Cody family in England. It has a 120-hp. engine and the inventor makes the claim that he has used few, if any, of the ideas of other designers in the construction of the machine. With the exception of one assistant, the entire machine was built by Mr. Cody and members of his family.

In the illustration Mr. Cody is shown making a test of the resiliency of his newly constructed chassis. The



Inventor, Weighing 224 Pounds, Tests Spring of Framework by Walking on Aeroplane's Wings test should prove an adequate one as Mr. Cody is said to weigh 224 lb., or 16 stone, in the English phrase. The monoplane is designed as a military type and in carrying out this idea the maker leaves it without protection in all sorts of weather. One of the features of "The Dart," as the inventor has named his machine, is the engine which, although of large size, is operated with comparatively little noise. It is said that at a distance of half a mile it is almost inaudible.

HINDUS GAMBLED OVER NEW YORK FIGURES

New York cotton-market quotations have been the basis of a peculiar form of betting in Calcutta, India, and the efforts of the police to stop the craze have only recently succeeded. The Hindus themselves appreciated the serious nature of the betting craze, which flourished among the very poor and resulted in many cases of insanity, so that when the police finally suppressed this gambling, a Hindu ceremony of thanksgiving was held. The blessings of the goddess Kali were invoked for the police, and a singing party distributed sweets, made of sugar and treacle, along the streets to the accompaniment of cymbals and drums, as shown in the illustration. The gambling method which was stopped was simply to bet on the total sum of the five quotations on cotton which were daily cabled from the New York market.

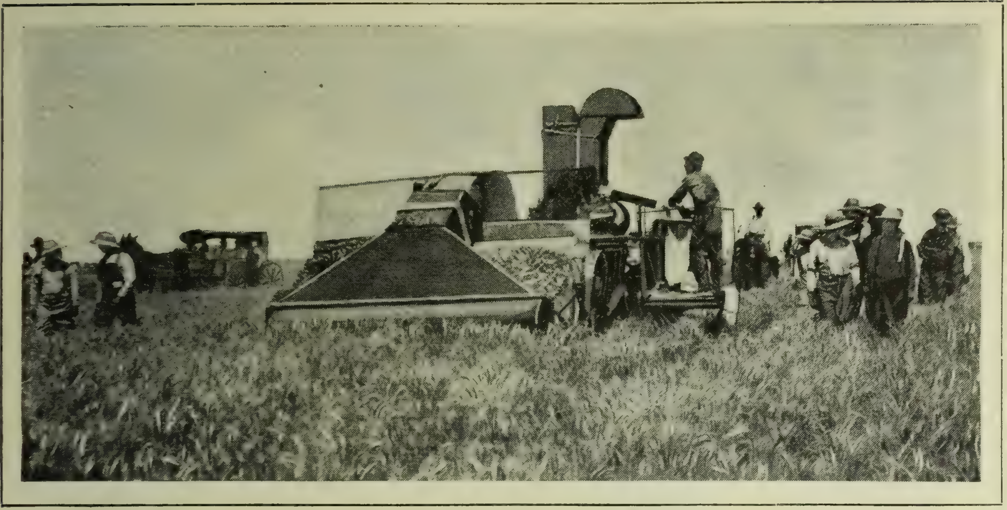
Courtesy Illus. London News

Hindu Thanksgiving for Suppression of Gambling over New York Cotton-Market Figures

THRESHING WHEAT AS IT STANDS IN FIELD

When harvest arrives in Kansas it is time for a progressive farmer to get his small grain into sacks with all possible speed or be ready to put some ugly figures on the wrong side of the ledger. Big crops require many farm hands at harvest time and these are getting scarcer every year. This situation has given a young Kansan an idea which is getting considerable attention among the wheat growers. He has invented a machine to thresh the grain as it stands in the field. He claims that one man and four horses can do the work of a whole threshing crew.

This thresher is set on a truck in such a manner that it can be raised and lowered at will. A 25-hp. gas engine operates the mechanism. As the thresher moves along, heads of grain are blown against a cylinder set with 4-in. teeth. This rotating cylinder lops off the heads and tosses them back into a cavity. From this the grain is carried up on a worm to the rethreshing cylinder which rotates at greatly increased speed. Having been threshed the grain is carried up a perpendicular tube called a cleaner and passes through a strong current of air from a blower. Here all chaff and dust is finally disposed of, and the



Threshing Wheat Standing in the Field

grain falls through another chute into the sack or wagon.

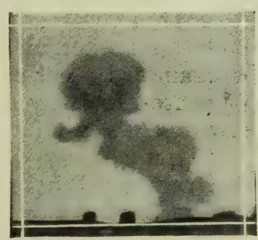
With the exception of the truck and the gas engine, the machine contains but eight moving parts and all these rotate. The current from the blower is said to be strong enough to pick up fallen grain in the field, but a finger is provided for this purpose if desired. After the threshing the farmer needs not remove the straw before plowing. He starts his plows to work when he is ready and plows the standing straw under.

EMERGENCY STEERING GEAR FOR AUTOMOBILES

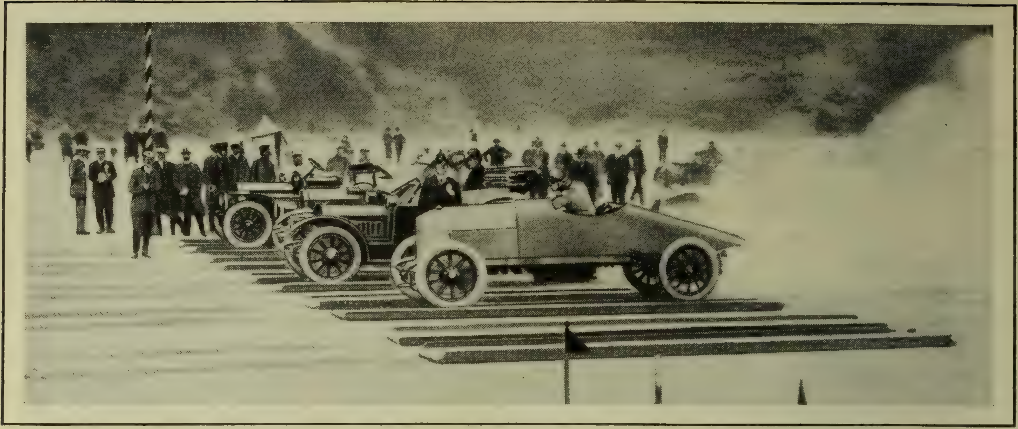
An emergency steering gear for automobiles, recently patented, is about to be placed on the market. The device is a double steering gear, each unit of which operates independently of the other. The main gear operates a knuckle joint, while the emergency device operates directly on the wheels of the machine, a steering post being fastened directly beneath the steering wheel and operating on a worm screw connecting with rods. The rods run to the forward wheels on which are bolted collars set in a flange bolted to the wheels. The flanges are so constructed that the collar rests in them and runs on ball bearings.

Should the main steering gear break, the rods connecting the two front wheels hold them from swerving and steer as if nothing had happened. If one of the rods connecting the two front wheels breaks, the other does the work. If a nut comes off one of the wheels, the flange and collars prevent the wheel from coming off.

BEGGING "POODLE" FORMED IN SMOKE



The illustration is the reproduction of an interesting photograph taken two or three minutes after the explosion of a powder mill located about five miles from Wilmington, Delaware. When the negative of the camera exposure was developed, the photographer discovered that the smoke rising from the explosion had so shaped itself as to suggest a small poodle dog reared on its hind legs in the act of begging.



Cars Lined Up on the Wooden Starting Trays, Waiting for the Signal

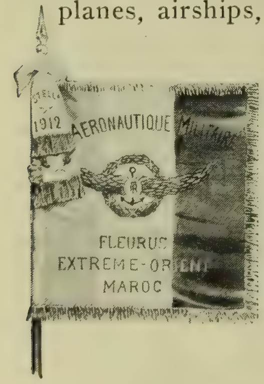
STARTING TRAYS FOR BEACH AUTO RACING

Automobile racing on the hard sands of the seashore is as popular in England as on the beach at Datona and Ormond, Florida. The most popular beach racing in England is at Saltburn, on the Yorkshire coast, under the auspices of the Yorkshire Automobile Club, and high speeds are attained.

One of the interesting minor features of these meets are the wooden trays from which the automobiles start. These are not much longer than the cars themselves, but they provide a base into which the wheels of the machines will not sink while waiting for the starting signal, and thus assure a clean get-away.

FIRST FLAG OF FRENCH AERONAUTICAL CORPS

The French Aeronautical Corps, which comprises operators of aeroplanes, airships, and ordinary balloons, received its official standard at a recent military review, but it already had an unofficial standard presented to it by a woman's aviation society of France. This standard is of silk, embroidered in gold, and bears a winged anchor and a laurel wreath in the center. The name "Fleurus" commemorates the battle at that place in 1794, at which a captive balloon was used in war for the first time. The legends "Extreme Orient" and "Maroc" refer to the use of the aeroplane in the far east and in Morocco. The name of the woman's aviation society is "Stella."



ELECTRICALLY DRIVEN TUG FOR INDIA

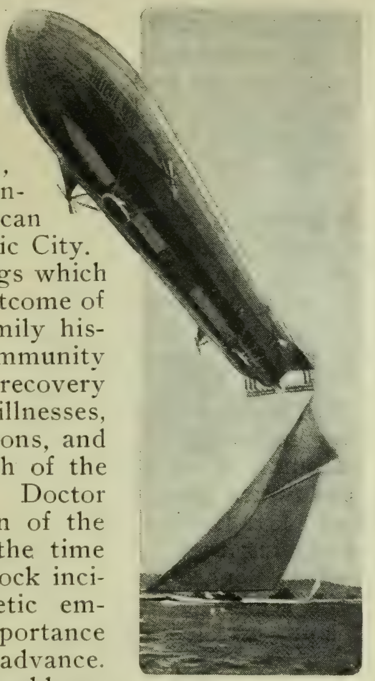
An electrically propelled tug, 59 ft. in length, was recently constructed in Rotterdam for service in India. A high-speed engine drives a generator which furnishes current for a 70-kw. direct-current motor on the propeller shaft. This motor drives the shaft at 232 revolutions per minute. The motor can be reversed from full power ahead to full power astern in from two to three seconds, as against the 10 to 15 seconds required for a good steam engine.

STUDYING A PATIENT'S RESISTANCE

Elements in the individual and family history of a patient likely to aid a surgeon in determining what degree of physical resistance might be expected from him when about to undergo an operation of the type defined as "borderland," were considered at some length by Dr. William B. Chase, of Brooklyn, in a paper read at the recent annual session of the American Medical Association at Atlantic City.

In the order given, the things which throw light on the probable outcome of a major operation are the family history as to longevity, family immunity or susceptibility to disease, recovery of the patient from former illnesses, accidents and surgical operations, and the present standard of health of the person to be operated upon. Doctor Chase states that the relation of the resistance of the patient to the time taken for an operation, the shock incident to it, and the anæsthetic employed is of the highest importance and difficult to determine in advance. Every operation, he says, should occupy the least possible space of time compatible with thoroughness. He condemns intrusting the administration of an anæsthetic to an undergraduate, as sometimes is done.

MEETING OF AIR AND WATER CRAFT



One of the most striking flights of the Zeppelin airship "Viktoria Luise" took place during the recent regatta held at Kiel, Germany, at which were present Emperor Wilhelm and a large part of the German high-sea fleet. The immense, cigar-shaped bag passed swiftly and gracefully over a string of seven yachts while the latter were racing for prizes. Only a little while ago the "Viktoria Luise" added to its fame by flying from Düsseldorf over Holland and around the coast to Hamburg, covering 350 miles in 12 hours. This dirigible seems exempt from the ill luck which has pursued so many of the Zeppelin airships, for it has never had any mishap although quite recently it made its one-hundredth excursion.

PRIZE FOR ALCOHOL FUEL TESTS

One of the automobile magazines of London suggests that the Royal Automobile Club at once set to work to organize a fund and to offer a substantial prize, even as much as $50,000, to the person who is able to prove, practically and theoretically, that alcohol meets all the requirements as automobile fuel.

Such a scheme would, according to Motor, London, be worthy of the club and of its position as a society of encouragement. Apart from benefiting the motor industry, it would help to create a new industry dependent upon agriculture, while England, with such home-grown fuel, would be relieved of the extremely serious risks to all road locomotion arising in the event of a war.

ℭA single electrical company in California claims to transmit current and operate its business over 38,000 square miles of territory included within 30 counties.

THE BRAINS BEHIND THE AMERICAN ENDURANCE RECORD

By A. F. ZAHM, Ph. D.

Emile Berliner, the famous inventor of the gramophone, and of the loose-contact transmitter which made the telephone industrially practicable, after a decade of experimenting with aeroplanes, helicopters, propellers and engines, is now seeing his motor and aeroplane ideas in successful use, though the general public has heard little of his work.

Tests this summer gave his aeroplane the American record and indicated that his thorough investigation will be a material factor in bringing American aviation once again up to, if not in advance of, European achievement. A Columbian biplane, embodying Mr. Berliner's ideas and equipped with a rotary motor of his invention, early in the summer established an American endurance record of 4 hr. 23 min. 15 sec. Mr. Berliner was a pioneer in developing the air-cooled, revolving-cylinder gasoline motor. His primary aim seems not to have been so much a commercial one, as to achieve in aviation the scientific success that characterized his previous inventions; but if well-built fliers of any type have a commercial possibility, that fact will hardly escape so gifted an organizer. He realizes that the one thing essential for dynamic flight is an adequate power plant, a perfectly reliable motor, not too costly to build and operate. This, in aviation, has been the great problem, beside which all others are trivial.

Mr. Berliner's engine has seven radial cylinders which rotate about a common fixed crankshaft, and carry with them the screw propeller attached to a hollow flange, projecting hubwise; neither pistons nor cylinders have any reciprocating motion; the pistons revolve about the fixed crankpin, the cylinders about the fixed shaft. The motion of both is therefore continuous, as in a turbine. The cylinders are machined from heavy forged nickel steel, the shaft from chrome steel, and the crank case is made of vanadium steel. The motor weighs 3½ lb. per horsepower, complete, with abundant margin of safety. In general, it resembles the celebrated Gnome engine, but has many novel and patented features of especial interest to the technician. It may be added that Mr. Berliner's motor experiments antedate by many years the appearance of that excellent French machine.

During the past decade Mr. Berliner has made many experiments with man-carrying helicopters, or vertical air screws. The purpose has been to rise directly from the earth and especially from the surface of water, then advance rapidly through the air by inclining the apparatus forward. His machine has repeatedly lifted a man from the ground, but not with sufficient steadiness to permit of free flight. Recent improvements, however, in the steadiness of thrust and the methods of control seem to indicate that Mr. Berliner is further advanced in the development of a helicopter flying machine than any other experimenter so far as published accounts disclose.

After the endurance record was made, Mr. Berliner and his associates contemplated launching the pilot on a non-stop flight from Washington to New York to manifest more fully the practical air-worthiness of the new biplane, but their attention was soon taken up by their Columbia monoplane of streamline type which has during the summer made some remarkable flights.

ℭA new astronomical distance unit has been adopted. It is called the "siriometer" and is equal to one million times the distance between the sun and the earth, or, approximately, the distance between the sun and the star "Sirius," or again, to be exact, 92,900,000,000,000 miles.

COLORADO'S FIELDS OF TUNGSTEN

Tungsten, which might well be termed the metal of this decade because of its rapid adaptation to a great number of uses besides the familiar ones of an alloy for steel and filaments for electric lamps, is found in limited quantities in many parts of the world, but about half of the world's supply comes from the United States. The greater part of this half is that coming from the apparently almost inexhaustible supply in Boulder County, Colorado. The tungsten found in Colorado is the purest in the world.

So vast is it in extent, and so abundant and easy to mine, that the price of this very valuable metal has gone down until it is now available for very wide commercial use.

The discovery of the remarkable deposit of tungsten in Colorado was more or less accidental. About 12 years ago a prospector happened to drop into Boulder, Colorado, in search of a fortune, as all prospectors are. Tungsten, at this time, was worth more than silver, and compared very favorably in price with gold. While this particular prospector was on an expedition up the old Caribou road, he discovered what proved to be a lot of tungsten ore on the surface of the ground. One can well imagine his surprise, as this same territory had been covered a number of times by other prospectors, and the great treasure overlooked. He hurriedly staked out one claim, then another, and a third, but then he paused in bewilderment, for he saw that loose tungsten ore covered the ground for miles, in fact, as far as the eye could reach. Therefore, he decided to take up a homestead claim, which was his only way of getting the greatest possible acreage of this exceedingly valuable mineral field. He built many air castles, and tore them down, in order to make room for larger and more luxurious ones, as he went over the great extent of the tungsten field, trying to pick out the richest for his homestead claim.

In a short time this prospector was on the high road to fortune, as he was supplying the market with large quantities of tungsten at very fancy prices. Other miners and prospectors soon arrived on the field, however, and everyone began picking up tungsten ore from the ground and shipping it. This enormous increase in production of tungsten was followed by a very decided drop in its value, and, on the other hand, there was an amazing leap upward in the demand for it, as the price no longer made its use prohibitive. Thus began the era in which all manufactured products depending upon the use of tungsten, and all industries using it were placed upon a more substantial basis, as the supply was no longer uncertain.

Flower-decked muffs made of some light, dainty fabric are becoming fashionable with English women. The term "garden muffs" has been given to them, and the varieties are numerous

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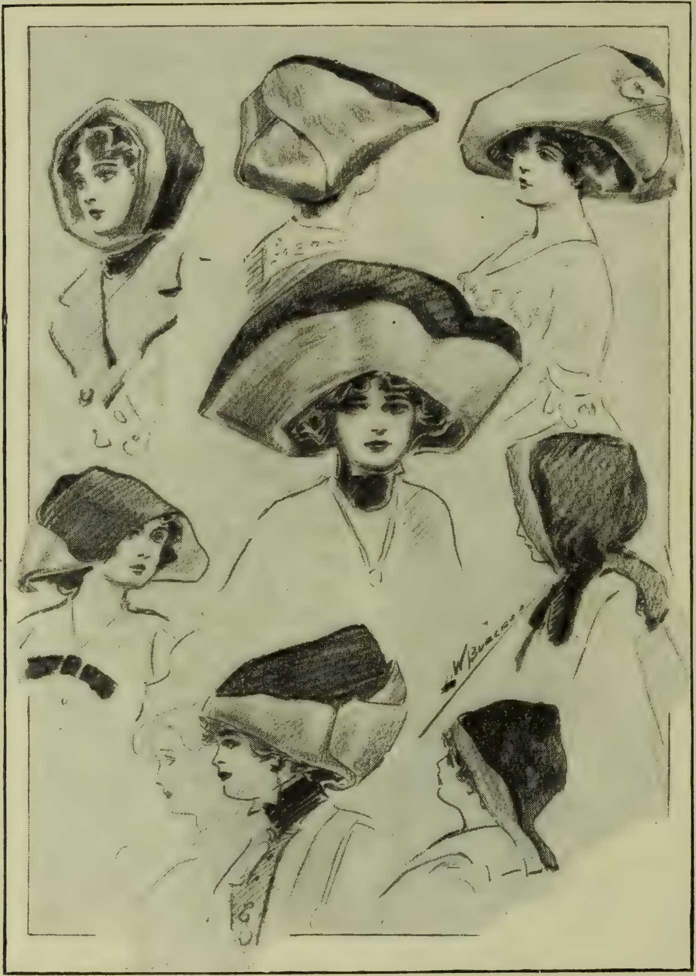
ℭApparently there is not so much originality in the wearing of slippers having diamond-studded heels as the press of the country seemed to find when a western woman appeared in Washington, D. C., so shod. In Ancient Rome women ornamented their low shoes with pearls and gold embroideries, and many of the slipper soles were made of solid gold, studded with gems, in an attempt to surpass others in lavish adornment.

HOOD HAT TWISTED INTO MANY SHAPES

A hood-hat combination which is creating considerable interest abroad because of its adaptability, invented by a tourist in Switzerland last winter, is shown in several of the shapes it may be changed into in the accompanying illustration. It is made in all-wool flannel or of soft satin in pastel shades, and is equally suitable for motoring, yachting, traveling by train or ship, golfing, hunting, Alpine climbing, etc. Its first shape is that of a simple hood, which can, with a simple twist or two, be turned into a half dozen different forms of smart and becoming hats.



The Shapes the Simple Hood may be Converted Into by a Twist or Two

AUTOMATIC DEVICE FOR LOCK RECORD

A combination time recorder and constant watchman is the latest invention of a Chicago man. The recorder is electrically attached to the lock of a store door, private room, safe room or vault, and so arranged as to give an automatic printed record of the exact time the door is locked and unlocked, and who performs these operations.

The system consists of the lock upon the door connected by cleverly concealed wiring to a master clock located wherever convenient. The master clock is in turn electrically connected to the recording machine, which is so small that it may be placed conveniently within a roll-top desk. Employes who open the store in the morning, and close it at night, members of the firm, watchmen, bookkeeper, etc., have numbered keys. When one of these keys is inserted in the lock and the bolt turned in, the recording machine automatically prints upon a ribbon of paper the number of the key, the word "In" or "Out" according to the direction in which the lock is turned, and the year, month, day, and time of day. The watchman's key is so made as simply to fit into the lock and actuate the recording device without making it necessary for him to open the door unless there is something which demands that he enter. When a burglar comes along or some unauthorized person with an unnumbered key which fits the lock and opens the door, a big bell within the shop instantly sets up a terrific clamor, which cannot be stopped until the concealed button controlling it is discovered.

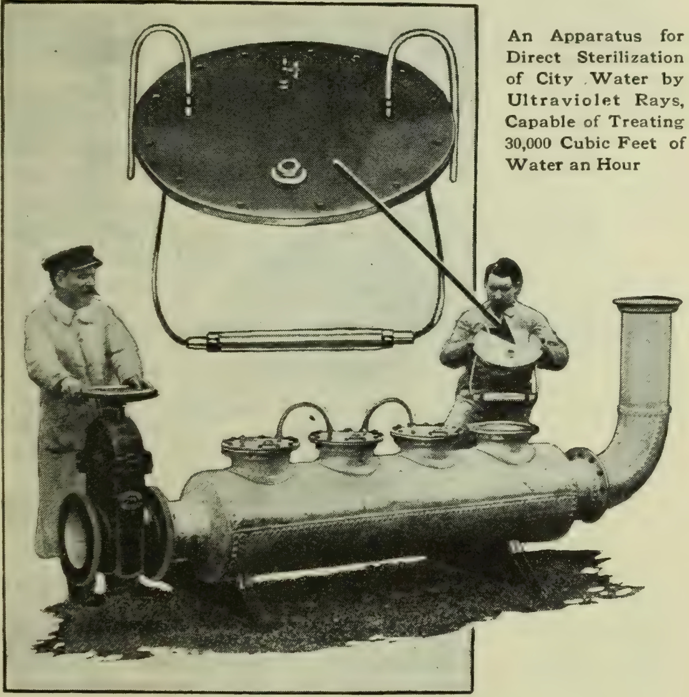
ELECTRIC POWER FOR LAKE FREIGHTER

Vessel owners on the Great Lakes are manifesting interest in the news that a contract has been placed for a lake and canal type of boat with electric-power equipment by a concern of New York and Montreal. The contract was placed in England and the specifications call for a "Canadian" freighter with two high-speed six-cylinder generating engines, developing about 350 hp. each, at 400 revolutions per minute, with their dynamos and exciters. The propeller shaft will be fitted with a special squirrel-cage induction motor, reducing the speed to 80 revolutions per minute.

What particularly attracts the attention of lake-vessel men is the fact that externally and from the standpoint of propulsion, the new boat's propeller and hull will be indistinguishable from the usual steam equipment. It will be possible to cut out one of the engines if necessary at any time for readjustment without interference with the other and with only slight loss of speed. Two hundred tons in weight, represented by engines and fuel, will be saved in the adoption of electric power, and fewer men will be required for the engine crew. Another important advantage will be the elimination of the boilers, resulting in an economy of space, which will permit just that much more room for storage of cargo.

ULTRAVIOLET STERILIZER FOR WATER MAINS

The sterilization of water by means of the ultraviolet rays from mercury-vapor lamps, a method which underwent successful tests at the Pasteur Institute in Paris, and which has been described before in this magazine, can be used in direct connection with city mains. The apparatus shown in the accompanying illustration is designed for this purpose. The sterilizing cylinder is provided with four handholes, the mercury-vapor lamps being attached to the under sides of the covers. A number of sheet-metal guides serve to direct the water flow close to the lamps. About 30,000 cu. ft. of water may be treated per hour.



An Apparatus for Direct Sterilization of City Water by Ultraviolet Rays, Capable of Treating 30,000 Cubic Feet of Water an Hour

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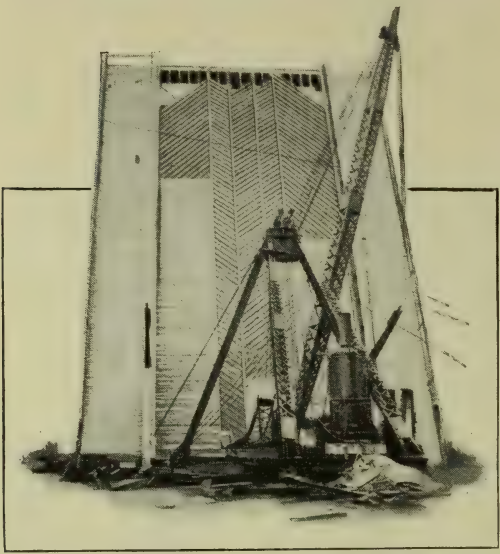
ℂThe Zeppelin dirigible balloon "Schwaben I," used for passenger traffic in Germany last year, was completely wrecked by an explosion at Düsseldorf, Germany, just after its season of flying opened this year.

BASCULE BRIDGE PROVIDES OPTICAL ILLUSION

A 102-ft. bascule bridge recently under construction in Milwaukee, Wis., drew much attention because of the peculiar optical illusion provided by it when raised to a vertical position for the passage of shipping. The sections of the under layer of planking were laid at an angle, and the surface layer, but partially done, as shown in the illustration, is laid straight. The illusion of gabled roofs was startling when the bridge was raised.



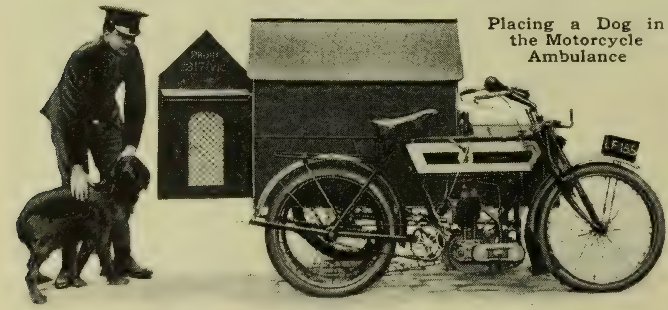
A Gabled-Roof Illusion; the Result of Laying Planking at an Angle

FAMOUS DELHI PILLAR IS MADE OF WROUGHT IRON

From specimens of metal obtained by Sir Robert Hadfield it has been determined that the famous iron pillar at Delhi is an excellent type of wrought iron. An analysis of the metal shows it to consist of: carbon, 0.08 per cent; silicon, 0.046; sulphur, 0.006; phosphorus, 0.114; iron, 99.72. The lowness of the sulphur percentage indicates that the fuel used, probably charcoal, must have been very pure. The metal contains no manganese, which is rather remarkable, since that element is usually present in wrought iron.

MOTOR AMBULANCE FOR DOGS

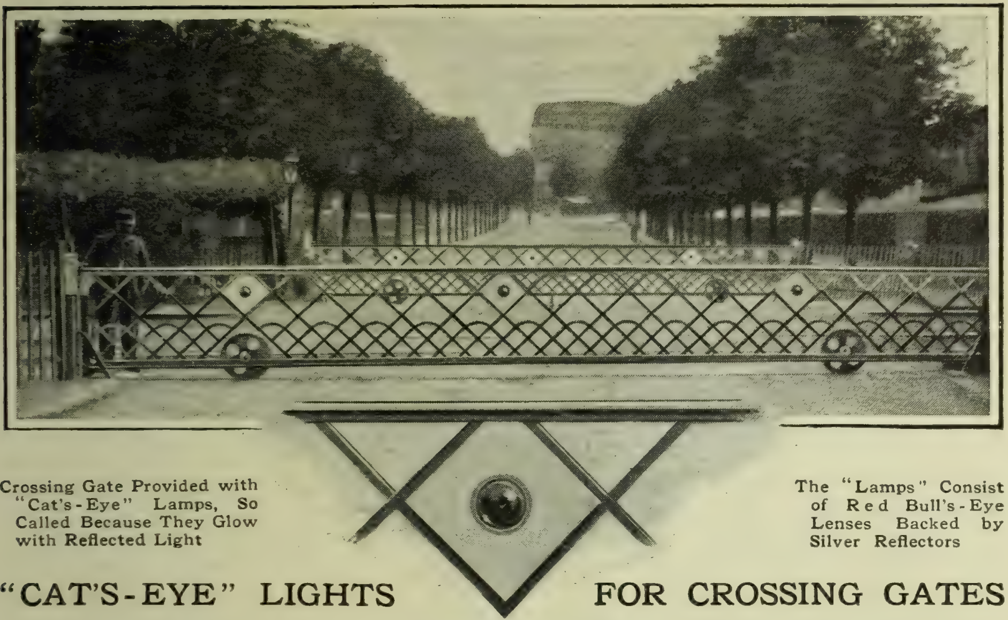
The Knightsbright Animal Hospital and Institute, London, is equipped with a special motorcycle ambulance which is particularly useful in answering emergency calls, as, for instance, when a dog is injured on the streets. It has shown itself to be a reliable first-aid ambulance in many cases.



Placing a Dog in the Motorcycle Ambulance

THE WATER REQUIRED FOR LAWN SPRINKLING

The Department of Public Utilities of Spokane, Wash., recently issued a booklet containing, among many other things, some very interesting information concerning lawn sprinkling. The sprinkling of the lawn every day is, apparently, more of a recreation for the householder than a necessity of lawn culture. The booklet draws attention to the fact that a lawn cannot be produced by water alone, and recommends a depth of soil of 12 in., and the use of bone meal, wood ashes, or manure as suitable fertilizers. A thorough watering twice each week is considered sufficient in Spokane.



Crossing Gate Provided with "Cat's-Eye" Lamps, So Called Because They Glow with Reflected Light

The "Lamps" Consist of Red Bull's-Eye Lenses Backed by Silver Reflectors

"CAT'S-EYE" LIGHTS FOR CROSSING GATES

"Cat's-eye" lamps, so called because they are not luminous in themselves but become luminous through borrowed light, are being used in France on railway crossing gates. Each gate has three red bull's-eye lenses backed by silver reflectors mounted in diamond-shaped frames. When an automobile approaches the barred crossing the light given out by the machine's lamps is vividly reflected by the "cat's-eye" lamps, giving warning of the presence of the gate. The cat's-eye lamp as a tail light for motorcycles and automobiles was described in a previous issue of this magazine.

CONQUERING SURGERY'S GREAT ENEMY

By LEONARD K. HIRSCHBERG, M.A., M.D.

If you have ever read Pepys' diary or the tales of Bocaccio or other annals of the thirteenth century Black Plague, you will remember with what horror those dying multitudes appalled you. Yet on the battlefield and after the Civil War of half a century ago almost as many men died of collapse, infections or shock from the operations then performed.

With the advent of later surgical knowledge, the discovery of germs as the cause of disease, and the additions of chloroform, ether, cocaine, and other pain-preventing drugs to the doctor's equipment, fatalities during and after operations were reduced wonderfully. Still one in every few thousand cases would die even after chloroform, cocaine, or ether anæsthesia.

Soon the possibility of death following a surgical operation was made still more remote by abolishing the use of chloroform. It was discovered about 10 years ago that the use of chloroform is decidedly dangerous both in the maternity ward and in the surgical clinic. Gradually during the past few years, as this danger was more and more recognized, and ether more universally used, deaths after childbirth or the surgeon's knife have become rare indeed.

To still further reduce the fatalities incident to operations, Dr. George W. Crile, of Cleveland, some five years ago adopted laughing gas or nitrous-oxide gas, theretofore used as an anæsthetic agent only by dentists, and applied it, in combination with oxygen gas, in his hospital practice instead of both chloroform and ether. Wonderful to tell, operations lasting many hours are now performed in some of the large American hospitals with only this mixture of oxygen and nitrous oxide.

Nevertheless, with all these marvelous improvements, with all these reductions of danger and possible death, the surgeons were not satisfied. The doctors of the clinics and the research workers of the laboratories knew that life could be made still longer and less hazardous. So they continued their critical researches, and just the other day this same Doctor Crile made another far-reaching discovery.

Through this discovery the possibility of death during or after even the most vital surgical exploration, whether from disease, nervousness or exhaustion, is still further lessened.

When placed under such a safe anæsthetic as laughing gas, man and animal can withstand, without any exhaustion or shock following, three times as much injury and irritation as is the case under ether.

Now in the course of such severe operations as those necessitated after railroad accidents, long falls, severe automobile injuries, broken skulls, pistol wounds, cancers, and the like, the patient's system reacts against every cut, stitch, and pulling together of blood vessels, ligaments, muscles, and nerves, especially under the older anæsthetics, and this reaction produces the exhaustion, collapse, and severe shocks after chloroform and ether.

With these facts before us we can readily understand why a strong robust patient may emerge from the operating room broken and shattered, requiring months or perhaps years to recover fully, says Doctor Crile. It is for the same reason that the same man is shattered and broken if run down by a railway train and mangled; if he has passed through a horrible sensation, such as having a cold pistol pressed against his forehead in the night by a highwayman; if he has witnessed a murder, or if he has been subjected to any other of the many nerve-shattering experiences of life. Whether they impair or whether they break the nervous system, they are, except for the memory, just the same as surgical operations under ether.

The importance of the new contribution that Doctor Crile makes to surgery lies in the fact that all exhaustion and injurious results can be obviated by not only soothing the brain with an opiate or with nitrous-oxide gas, but by simultaneously disconnecting, for the time being, the place operated on, the field of the injury and of the cutting, from the brain itself.

This is a wonderful discovery. True enough, many surgeons have at times carried out, unwittingly, this very mode of action, this double method of anæsthesia. But they never persisted in it, they never converted the world's great surgeons, and, most important of all, like the great chemists who always handled pitchblende without ever suspecting the radium within, they knew not what they did; and as it remained for the Curies to find the radium, so Doctor Crile was the first to inquire into the whys and wherefores of double anæsthesia.

Physical injury to any sensitive part, he finds, causes a discharge of nervous energy leading ultimately to exhaustion. This discharge of nervous energy is not prevented by inhalation anæsthesia. The exhaustion is due to driving the motor mechanism of the human system. With equal facility may exhaustion be produced by perceptions through the special senses, such as seeing or hearing danger. The human motor mechanism may be driven by a physical-contact stimulation, or it may be driven by perceptions through the special senses. Whatever the cause may be, the stimulus is always through the awakening of associative memory; that is, all action is in accordance with the law of association through memory.

Now then, argues Doctor Crile, the practical application of all this is to conduct every operation so that no associative, painful, or dramatic incident may enter even the narcotized brain of the quieted patient. A pleasant respiratory anæsthetic, such as nitrous oxide, should be used with some internal medicine that quiets the nerves. When the patient is ready for the knife, the site of the operation is completely isolated from the brain by injecting a new local anæsthetic of his own.

All exhaustion, fright, after-pains, shock, pneumonia, and the other after-effects are thus forever done away with. There is no depression, no lessening of the body's immunity to germ diseases, and the patient leaves the operating room strong and virile, already on the way to uninterrupted convalescence and rapid recovery, and with all the chances in his favor.

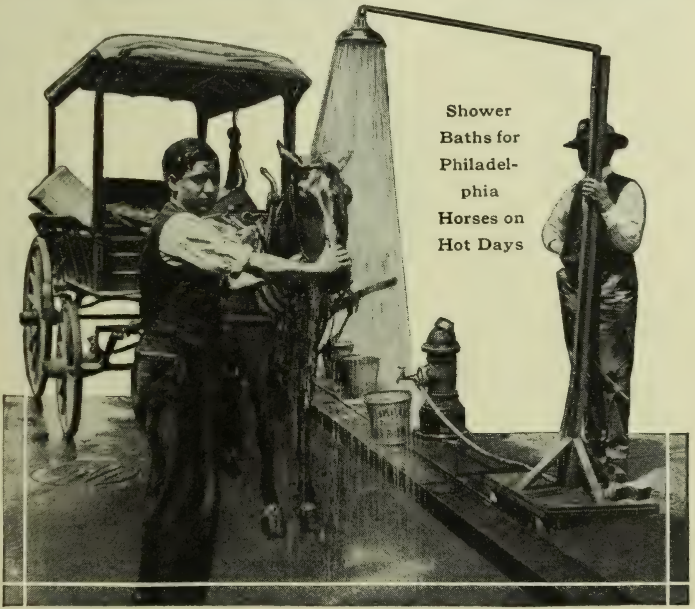
LONDON HARBOR IMPROVEMENTS

The harbor of London, which has long been inadequate to accommodate the enormous shipping and to satisfy the demands for modern commerce facilities, is to be improved at a cost of many millions of dollars.

The immediate improvements, enabling great modern vessels to ascend the Thames to London proper, comprise the construction of a great dock, which will be named South Albert dock, at a cost of approximately $12,000,000. This dock will be about 4,600 ft. long, with a width of 600 ft. and a depth of water of 38 ft. It will be reached through a lock, 800 ft. long by 100 ft. wide, with a depth of 45 ft. The intention, when this dock is completed, is to greatly deepen the Thames and to construct a second dock, to be called the North Albert, at a cost of more than $20,000,000. This dock will be about 7,400 ft. long, with a width varying between 930 and 1,000 ft., and a normal depth of 45 ft. The lock which will give access to this dock will be 1,000 ft. long, 130 ft. wide, and will have a depth of 52 ft.

HORSES TAKE COOLING SHOWER BATHS

Philadelphia horses have been provided with shower baths during the hot weather. The accompanying photograph shows a humble delivery horse "getting his," and he seems to enjoy it. All day during the hot season horses could be seen in line, the drivers waiting for a chance to give their animals a taste of the luxury. The shower baths were placed in the streets by the Women's Society for the Prevention of Cruelty to Animals, and were so constantly in use that they were considered a great success, and will be supplied another summer.


Shower Baths for Philadelphia Horses on Hot Days

BEAUTIFUL ANCIENT GLASS UNEARTHED IN PALESTINE

Several magnificent examples of ancient millefiori (thousand flowers) glass of rare beauty and value have recently been unearthed by natives in Palestine. The plates and bowls were found in ancient tombs on the coast and are valued at from $500 to $1,000 each.

Millefiori glass reached its finest development in Grecian-Roman times. As far as is known, this glass was made by cutting bits from a stick or cane of glass, itself formed by uniting a number of small rods, and then placing these bits in a mold in such manner as to produce any pattern desired.

One of the Ancient Millefiori (Thousand Flowers) Plates Discovered in Tombs in Palestine

SCIENTISTS MAKE CHEMICAL RUBBER

British scientists are indicating their belief that the long-sought method of making synthetic rubber, or rubber by chemistry, has really been found, and are maintaining their belief in spite of the doubts cast by previously announced discoveries and subsequent failures. The process of making rubber from fusel oil was recently announced by Prof. W. H. Perkin, of Manchester University, on behalf of a group of scientists who had conducted the experiments. Of the results the conservative and authoritative London Lancet says: "It is probable that we are recording a synthetic triumph of the greatest moment to the world, for it is not a rubber substitute that has been made, but rubber itself."

Not only do the British scientists claim to be able to produce rubber for 20 cents a pound while the natural product is selling for 80 cents, but they also announce that the by-products of the process are fuel alcohol, suitable for automobile engines, and acetone, the incorporating element in the manufacture of the high-power explosive known as cordite. The alcohol can be marketed for much less than gasoline and is a safer and cleaner fuel. Acetone, in the limited available supply costs at present $450 a ton. As a by-product of a rubber manufacture it is claimed that it can be sold for $150 a ton. Modern warfare depends on acetone to prevent the spontaneous explosion of cordite.

If the hopes of the London scientific authorities are realized, not the least of the results of the commercial manufacture of rubber will be a tremendous increase in the growing of corn and potatoes throughout the United Kingdom. The Irishman's potato patch will come into its own. The process of creating man-made rubber, stated in its simplest terms, consists in reducing a moist mixture of cereals and potatoes to a semiliquid starch and then by a double fermentation converting this starch into fusel oil, alcohol and acetone. The fusel oil is converted into a substance called isoprene, which was until recently only known as a distillation product of natural rubber, and which when left for a time in contact with metallic sodium becomes a pure white rubber.

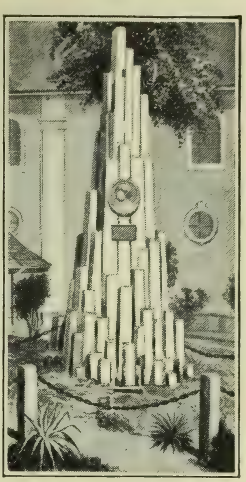
The attempts to produce rubber by chemical means had failed until 18 months ago when a German, Prof. Carl Harries, of Kiel University, discovered isoprene and later made it from oil of turpentine. He even secured rubber from this process, but only at tremendous cost. Then the race with Dr. F. E. Mathews, Sir William Ramsay and Professor Perkin started. A French scientist was also concerned in the discovery, his contribution being a cheap method of producing the fusel oil from fermented potatoes and cereals, so that the discovery might well be called international. Just three months after the English scientists had completed their experiments and secured their patents their German rival arrived at the same results, but found that he was too late to profit by them.

Experiments have shown that the synthetic rubber can be vulcanized like the natural product. An automobile tire made of the artificial product outlasted a tire of the natural rubber by several weeks, both being used on the same vehicle. To date, however, the experiments have gone no farther than the laboratory stage. Automobilists who look forward to a day of cheap tires and a cleaner, cheaper fuel than gasoline must wait until some one tries the experiment of producing man-made rubber on a large commercial basis.

MOVING BELTS BREAK FILAMENT LAMPS

Investigation in factories where graphitized-filament lamps, used to replace the ordinary carbon lamps, were found to break as soon as placed in the sockets, showed that the failure of the lamps was due to the fact that they were all placed near a moving belt. Although imperceptible, static charges from these belts collected on the globes, setting the filaments in rapid vibration and rupturing them. Equipping each socket with a metal reflector is said to be a simple and effective method of preventing such damage.

A BEAUTIFUL MONUMENT OF NATURAL CRYSTALS

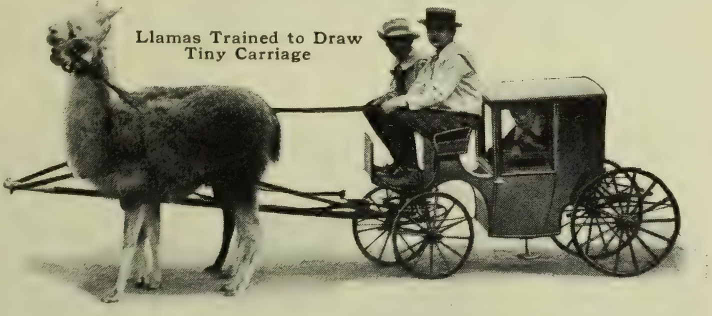

Courtesy Über Land und Meer

In the little town of Steinschönau, Bohemia, is an exceptionally unusual and really beautiful monument formed out of natural crystals, the longest of which are from 23 to 26 ft. in length. The curious monument was erected by a society of war veterans, at their fifty-year jubilee, in honor of Emperor Franz Joseph. The crystals, which are pentagonal or hexagonal in cross section, were taken from a basalt formation located near Steinschönau.

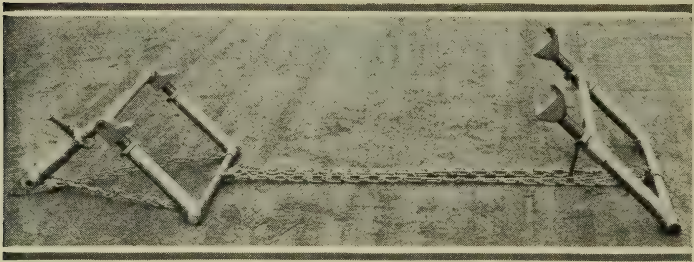
LLAMAS IN HARNESS

An attraction at Hamburg's famous zoological garden is a pair of tame llamas, that carry passengers about the grounds. They are declared to be the only animals of their kind in Europe that have been trained for this purpose.

The llamas draw a carriage, and at a recent test it was shown that they can easily pull a load of 450 lb. They are quite docile and readily answer to the rein.


Llamas Trained to Draw Tiny Carriage

LIFTING AN AUTO BY ONE-MAN POWER



One Man Can Operate This Auto Jack

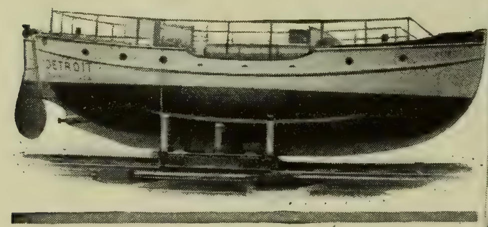
The auto jack shown in the accompanying photograph is capable of raising a heavy motor car with no more power than that one man is capable of exerting. The automobile is first run into position over the two rectangular frames, which are connected by a strong chain. Once in place, the "thrust bar" at the left is set in operation by means of which the frames are gradually brought to an upright position. The threaded pillars on the four corners of the frames are easily adjustable and by turning them the car may be raised as desired.

THIRTY-FIVE-FOOT MOTORBOAT CROSSES ATLANTIC

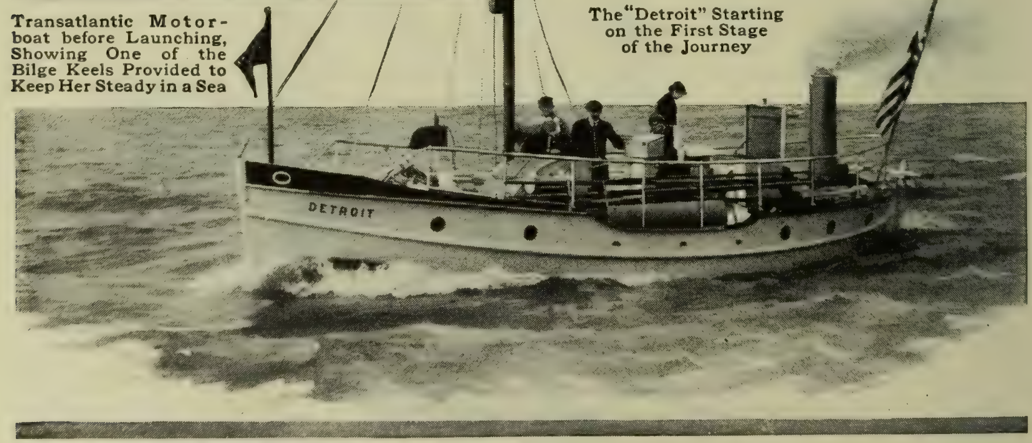
The little 35-ft. motorboat "Detroit," built especially to cross the Atlantic under her own power, made the trip in 24½ days. She arrived safely at Queenstown, Ireland, on Aug. 7. The little boat started out with the expectation of making, all told, a trip of about 4,000 miles, of which the voyage from Detroit to New York was the first stage, the transatlantic voyage the second, and a continuation of the voyage to St. Petersburg the third. This is the longest voyage ever attempted by a sea-going motorboat of such small size.

The "Detroit" is 35 ft. long, 9 ft. wide, and draws 5 ft. of water when loaded down. She is driven by a 16-hp. engine, and has a speed of about 7 miles an hour.

The greatest problem in constructing a transatlantic craft of this size



Transatlantic Motorboat before Launching, Showing One of the Bilge Keels Provided to Keep Her Steady in a Sea



The "Detroit" Starting on the First Stage of the Journey

Photos Copyright, 1912, by Mathews Boat Co.

was to find storage for the amount of gasoline necessary for a 2,700-mile trip. About 1,200 gal. of gasoline was carried in seven tanks placed in the hold of the boat, and two additional tanks were located on the deck amidships. A crew of five men made the trip, and food sufficient for 90 days was carried. None of the crew was allowed to carry matches, owing to the large amount of gasoline on board. All matches were kept under lock and key by Captain Day, who gave them out only when positively needed. The little boat was lighted by electricity throughout.

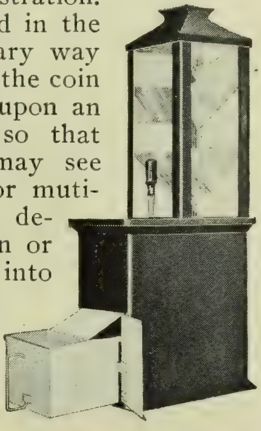
The little craft encountered heavy weather with a succession of gales and high seas. She was obliged to heave to nine or ten times and pitched tremendously.

NEW DIRIGIBLE BIGGER THAN EVER

In the construction of the German dirigible airships the tendency among the builders of this type of aircraft appears to be to increase the size, notwithstanding recent disasters that, naturally, might prove discouraging. The latest Zeppelin-type ship produced by Siemens-Schuckert is 386 ft. long and has a maximum diameter of 42 ft. 10 in., with a volume of 530,000 cu. ft. Three impervious partitions divide the four compartments. An air balloon is contained in each of the three forward compartments, the first of which is almost a perfect hemisphere, reinforced by 10 layers of rubberized linen. Gas which escapes from the forward compartments is received through safety valves into the fourth compartment which is maintained at normal atmospheric temperature. In shape the latter is an elongated cone. The keel of the ship measures 262 ft. in length and is constructed of steel framework. In this are carried supplies of water and gasoline and two 24-hp. motors for filling the balloons and operating the safety valves. Attached to the motor is the guiding rudder, five planes of 13 by 4 ft. Communication between the three cars suspended from the keel is maintained by a telegraphing device. In the middle car are located the guiding wings. Equipment carried in the other cars includes a 125-hp. motor, two depressing rudders and two two-bladed side screws. The blades are 9 ft. in diameter and run at 700 revolutions. The center screw has four blades and runs at 750 revolutions.

FARE BOX WITH NOVEL AUTOMATIC FEATURE

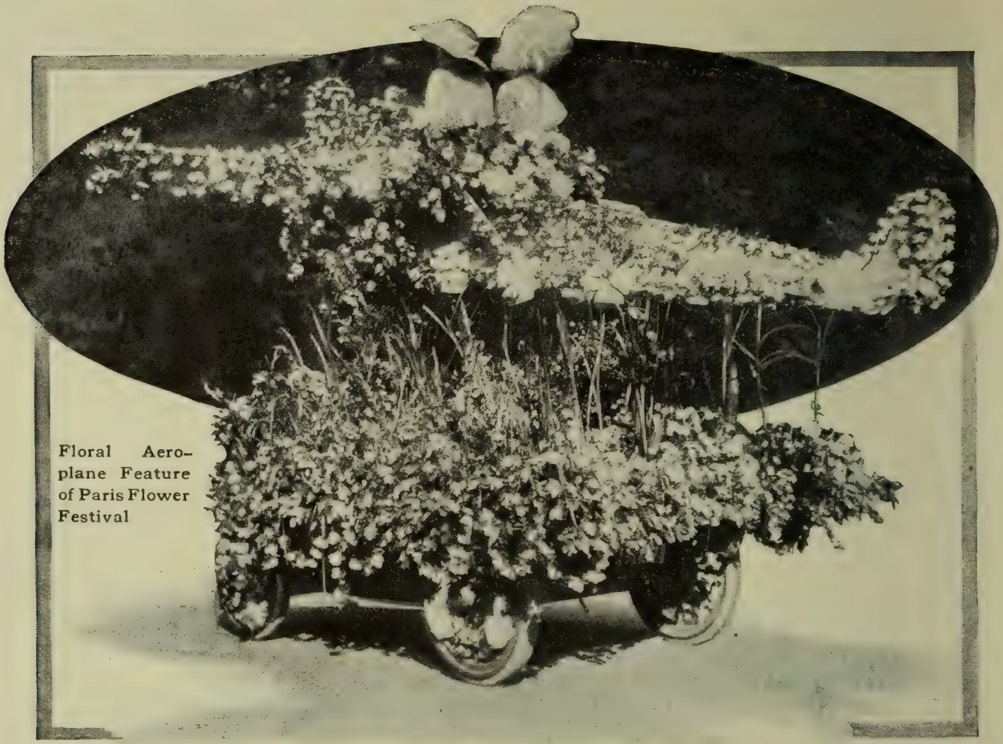
A fare box having an ingenious automatic feature, and designed for pay-as-you-enter cars, is shown in the accompanying illustration. The fare is placed in the box in the ordinary way by the passenger, the coin or ticket resting upon an aluminum plate so that the conductor may see that counterfeit or mutilated coin is not deposited. The coin or ticket is dropped into the final receptacle by means of a small lever, and it is the automatic action of this cash box which provides the interesting feature.



To remove the cash box from its position, it is necessary for the dispatcher or other railway official to open the outside of the fare box with a key. The cash box can then be easily removed, but in removing it the lid or cover, which up to this time has remained open so that the fares would fall into it, automatically closes and locks. The dispatcher now has the cash box in his possession, but the key is in the treasurer's office, and the fares cannot be removed until the box is delivered there.

A new cash box is placed in the fare box at the commencement of each run. It is claimed that no registration of fares is necessary with this type of collector.

FLORAL AEROPLANE CATCHES PARISIAN FANCY



Floral Aeroplane Feature of Paris Flower Festival

One of the most loudly applauded features of the recent Fête des Fleurs, or flower festival, in Paris, was the float shown in the accompanying photograph—an aeroplane mounted high over a motor car. The floral airship was of the monoplane type and carried an airwoman and a passenger.

MARATHON MILKERS ON A BIG DAIRY FARM

On the average dairy farm the man who can milk 15 or 20 cows twice a day is ranked as an excellent milker. Yet on a milk company's farm in New Jersey, 10 operators are milking 350 animals twice daily, an average of 35 cows per milker. Ever since modern dairy husbandry began to approach an intensive development the problem of the milk farm has been how to most efficiently utilize the labor of the milking force between milkings. In the winter time especially this was a hard nut to crack.

The manager of this eastern dairy farm got his mind to working overtime and devised the plan of developing his milkers into specialists who milked for 10 hours a day and performed no other labor. He corresponded with the managers and owners of other large milk farms in order to obtain their opinions concerning his new method, and found they did not believe it would work. In no wise discouraged this progressive manager put the proposition before his milkers and asked them if they would be willing to test out the plan. They enthusiastically assented.

Under this novel system the milkers begin work at two o'clock in the afternoon and milk steadily for five hours after which they have a seven-hour rest period. They resume milking at two o'clock the next morning and continue until seven o'clock when they again have the succeeding seven hours for leisure and recreation.

Only natural milkers, men who do not overly exert themselves and, in consequence, easily tire, are enlisted in this marathon milking work. After drawing the milk from each animal the milker has one and one-half minute's rest during which time he carries the pail of milk to the weighing room where he washes his hands as the milk is being weighed and emptied from the pail. This brief period is sufficient to relax and rest the forearms and hands of the operator.

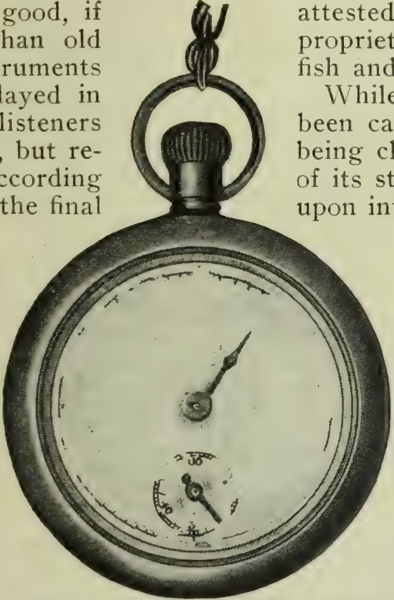
On the average, the dairy worker on this farm milks a cow every 8.57 minutes or 35 animals in 300 minutes. The fastest operator handles 40 cows in this time or a cow every 7.5 minutes. For the past 18 months the method has been in successful operation and both the men and the management are thoroughly satisfied with the system. The men receive 17½ cents an hour for their services, as well as being comfortably quartered and fed. Each milker works seven days in the week without any holidays.

MODERN VIOLIN BETTER THAN A STRAD

At a trial recently made in Paris, by a number of experts, it was shown that modern violins are as good, if not better in sound, than old ones. A number of instruments were numbered, and played in a darkened room, the listeners not knowing the marks, but recording their verdict according to the numbers. When the final vote was taken it was found that the instrument having the largest number of votes was of Belgian manufacture, made this year, while the second was French, manufactured in 1911. A Stradivarius was voted as third best (although valued at many thousands of dollars more than the modern violins which took a greater number of votes), and a Grancino fourth, but the fifth and sixth were also of modern make.

ℭA railroad near completion between New York and Boston is described as having no grade crossings and no signboards along its entire right of way.

BIG FISH CARRIES WATCH IN THE STOMACH

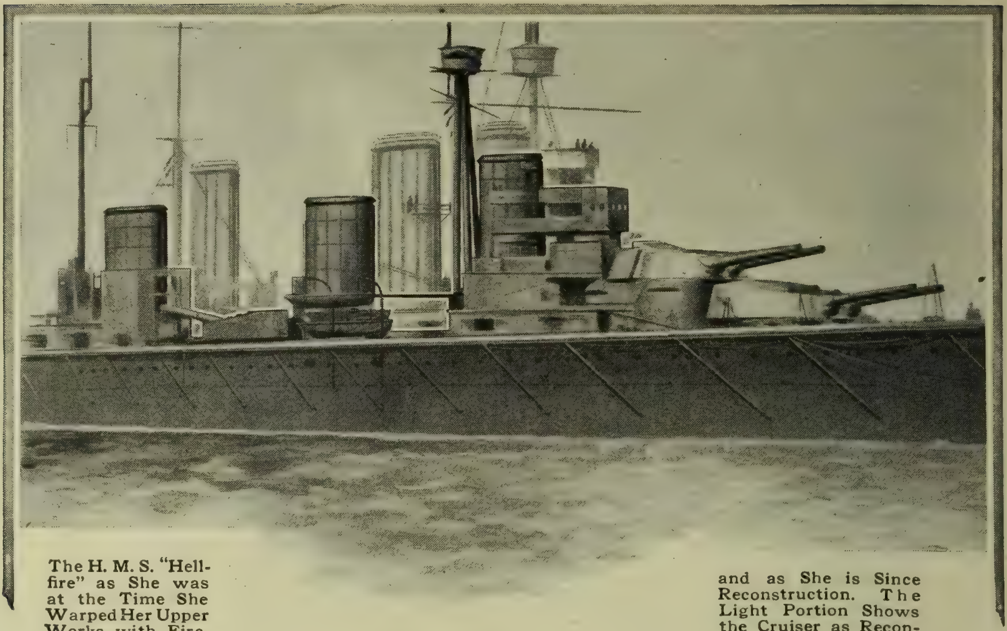


Watch That was Taken from the Stomach of a Lake Erie Fish and can Still be Wound and Run

That a watch was found in the stomach of an 8-lb. fish, is the story attested to by Alfred H. Hayes, proprietor of a Buffalo, N. Y., fish and game store.

While the fish, which had been caught in Lake Erie, was being cleaned, the great weight of its stomach was noticed, and upon investigation, a watch was found in it. About an inch of chain was attached to the watch, indicating that the owner probably had dropped it into the lake. Upon being wound up, the watch started to run, so the fish could not have been the possessor of it very long.

ℭExperiments have recently been made in Europe looking to the utilization of paper in the manufacture of pneumatic tires, tests recently made having convinced the experimenters that paper has the strength of metal, the elasticity of rubber, and a cheapness that is to be found in neither of these materials: all important qualities.



The H. M. S. "Hellfire" as She was at the Time She Warped Her Upper Works with Fire, and as She is Since Reconstruction. The Light Portion Shows the Cruiser as Reconstructed

THE RECONSTRUCTED H. M. S. "HELLFIRE"

The British battle-cruiser "Lion," which became widely known as the H. M. S. "Hellfire" because of the volume of flame belched from her funnels during the remarkable speed test in which she made 31.5 nautical miles (35.75 land miles) per hour, has now undergone the extensive alterations to her superstructure found necessary to protect her from herself. It will be remembered that the flames rose to a height of 50 ft. above her foremost funnel and that the heat was so intense as to twist the gun-control platform and every piece of metal on the navigating bridge out of shape.

In the alterations the tripod mainmast has been replaced by a single mast, which is located forward of the foremost funnel instead of behind it, and all three funnels have been altered in position and size.

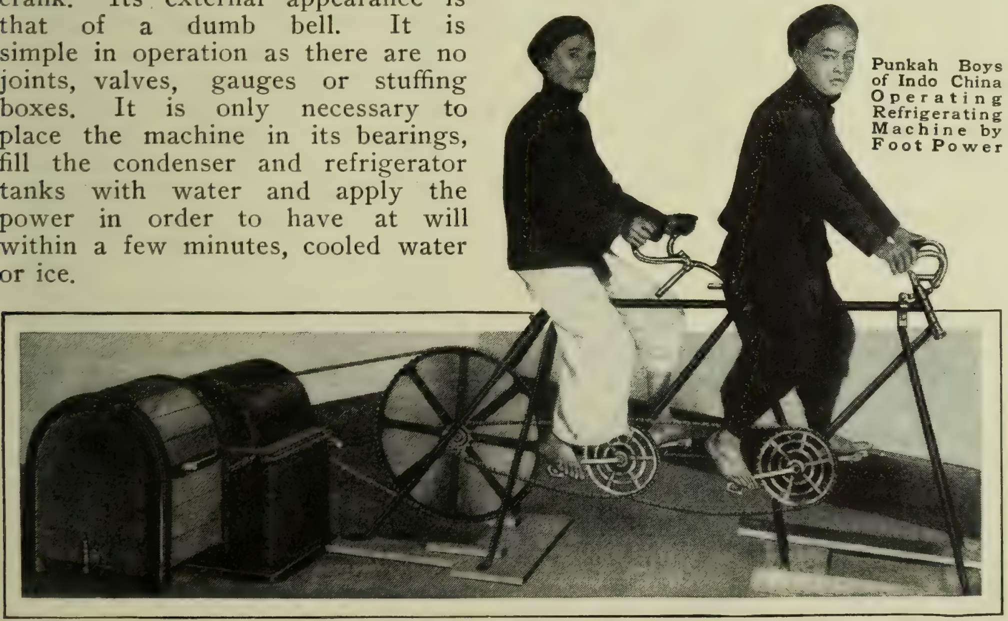
DETERMINING HOW MUCH PURE AIR FIRE NEEDS

Experiments to ascertain how little oxygen in air would still permit fire and how much carbon dioxide, the harmful gas produced by combustion, is required to prevent fire, have been carried on by G. A. Burrell, chemist at the Pittsburgh Testing Station. Different lamps were placed under a bell jar and allowed to remain until their flames were extinguished. Thereafter the atmosphere in the bell jar was analyzed and the results noted. Three per cent of carbon dioxide and 16.5 per cent of oxygen remained after a bonneted Wolf mining lamp, burning benzine, had been burned to the point of extinction. The same kind of lamp without the bonnet, burned until there were 3 per cent of carbon dioxide and 15.82 per cent of oxygen. The jar's content was 2.95 per cent of carbon dioxide and 16.24 per cent of oxygen after a candle flame was extinguished. An acetylene lamp continued to flame until there was 6.3 per cent of carbon dioxide and 11.7 per cent of oxygen, a mixture deadly to human life. A bunsen burner from which issued a flame of natural gas was extinguished when the bell jar contained 3.25 per cent carbon dioxide and 13.9 per cent of oxygen.

PUNKAH BOYS EXTEND ACTIVITIES

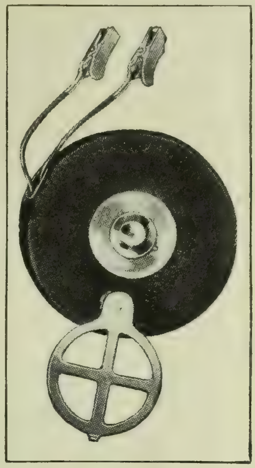
Here is an extension of the activities of the punkah boy and his fan, so common in the far East. This home refrigerating machine, set up in Hanoi, Indo China, is connected by chain to a tandem-bicycle frame and operated by coolies. Ordinarily the machine is operated by an electric motor but no current being available, the motor power is furnished by coolies. The machine was set up to make ice for drinking water and for table purposes in a hot climate.

The machine is the result of the studies and experiments of the Abbé Marcel Audiffren, a French scientist. Some have been running ever since they were installed, over five years ago, without repairs or recharging with the refrigerating chemical, which in this case is sulphur dioxide. The machine operates on the compression system and consists of two globes joined by a hollow shaft which carries on its extension a pulley or crank. Its external appearance is that of a dumb bell. It is simple in operation as there are no joints, valves, gauges or stuffing boxes. It is only necessary to place the machine in its bearings, fill the condenser and refrigerator tanks with water and apply the power in order to have at will within a few minutes, cooled water or ice.

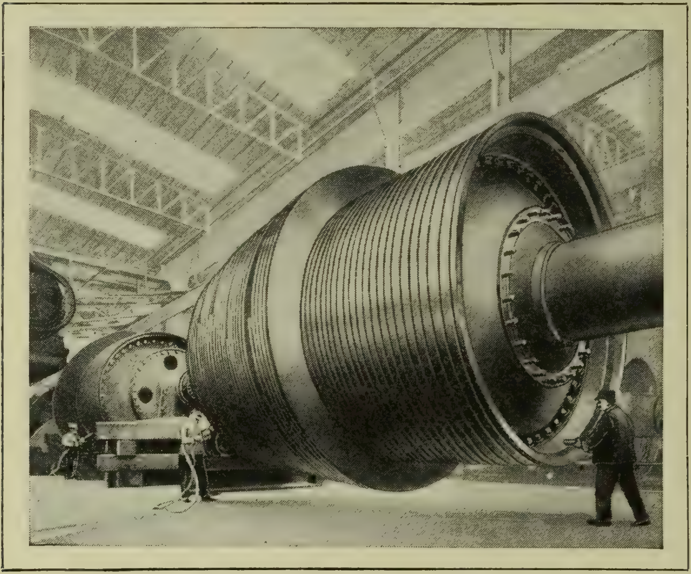


Punkah Boys of Indo China Operating Refrigerating Machine by Foot Power

A PORTABLE LIGHT FOR MOTORISTS' USE



The trim case shown in the illustration is not intended to inclose a measuring tape, as might be expected. It is a portable light, intended for automobilists and motorboat users. Current is obtained from a dry battery of four cells, such as is needed for the motor sparking. The extension cord can be lengthened at will and locked with a thumb catch. Two spring-clip terminals are attached to the free ends of the cord which can readily be snapped on the battery of an automobile. A 6-volt, 2-cp. lamp is used which fits into one side of the case and is backed by a reflector. A guard protects the lamp when not in use. This guard, as shown in the drawing, may be used to carry or hang up the lamp. With this neat illuminating device, motorboats or cars may be examined without danger of igniting gasoline or other inflammable material. Besides other advantages winds are powerless against it.



A Section of One of the Great Turbines Which will Drive the German Transatlantic Liner "Imperator"

THE TURBINES OF THE "IMPERATOR"

The German transatlantic liner "Imperator," the largest vessel yet launched, mention of which has appeared in this magazine from time to time, will be driven at a speed of at least 22½ knots (25.90 miles an hour) by turbines. Because of their great size and relative delicacy, these turbines have attracted much attention. One of the immense rotors weighs 135 tons, contains 50,000 blades, and is capable of developing 22,000 hp. The casing inclosing the rotors is 25 ft. long by 18 ft. wide, the propeller shafts are 18-in. in diameter, and the four-bladed bronze propellers are 16 ft. in diameter.

ℭRecent statistics show that New York City has 20 industries, each of which has an annual product valued at more than $20,000,000.

MOTOR HORN SCARES OFF BURGLARS

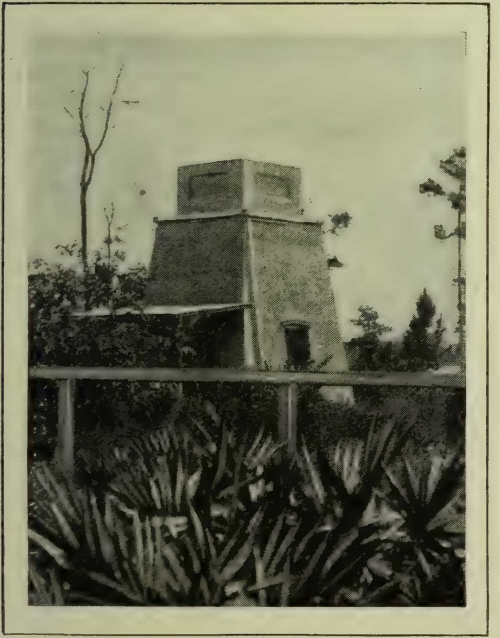
A novel burglar alarm, constructed of wires, batteries and the electric horn from an automobile, proved effective in a recent instance. A Chicago motorist had suffered from the depredations of midnight marauders in the garage where he kept his car, several blocks distant from his residence. On three different occasions thieves had broken into the building and had removed from the car all the attachments that could readily be turned into cash. In order to circumvent a possible fourth raid, the automobile owner fitted up an alarm of the usual type, save that in place of a gong the horn was utilized, and made connection with the door of the garage. The burglars soon thereafter returned for another visit which proved to be their last. When the door was forced, the horn emitted such a piercing shriek that the whole neighborhood was awakened from slumber and a patrolman who happened to be near arrested the two robbers.

$2,000 PRIZES FOR FLIGHT DURATION RECORDS

The Aero Club of France has offered prizes totaling $2,000 for a duration "Criterium," open from Aug. 15 to Dec. 31, 1912, to be awarded to the aviator who makes the longest flight without landing. The present record stands at 11 hr., 1 min., and the holder, Georges Foury, has declared that he is ready to fly 16 hours, if necessary, to retain the prize. An interesting and only slightly speculative figure is secured by multiplying the greatest aeroplane speed yet accomplished, 105 miles an hour, by the longest duration in reasonable prospect of accomplishment. The product, 1,680 miles, becomes the distance, then, that it will be possible to fly without a landing as soon as the fastest aeroplane yet made becomes capable of carrying as much fuel as any yet made. This prospect, which is anything but remote, since the two present records are held by fairly similar machines, will especially interest the crossing-the-Atlantic enthusiasts, in that only a further addition of 100 miles to the flight radius now definitely in reach will suffice to render the hoped-for result at least theoretically attainable.

A QUAINT RESIDENCE

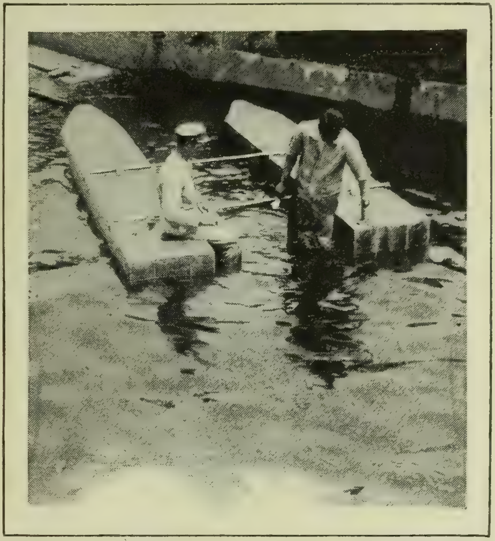
The pyramidal structure shown in the accompanying illustration is the home of a bachelor living northwest of Miami, Fla. It is constructed of concrete throughout. The top section is open and serves as a receptacle in which to catch rain water which passes down the pipe on the side of the building to a cistern.



Concrete House of Queer Design

COPPER PONTOONS FOR HYDRO-AEROPLANE

Copper-covered pontoons figure in the efforts of Earl Reid, the airman, to establish records in a hydro-aeroplane, at the League Island navy yard, near Philadelphia.



Copper-Covered Aluminum Pontoons for Hydro-Aeroplane

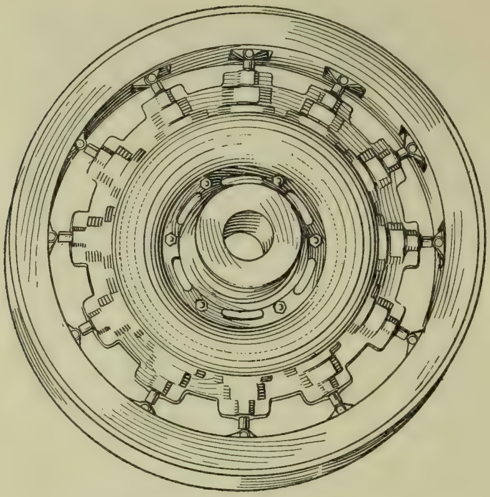
His former pontoons were of aluminum and as it was impossible to solder this metal so as to exclude water, the pontoons soon became too heavy for fast work. He has now reduced the weight of the aluminum by drilling holes in it, after which the pontoons were sheathed with a copper coating one five-thousandth of an inch in thickness. With the new "skin," friction has been considerably reduced.

CENTRAL ARM RESTS FOR REAR AUTO SEATS

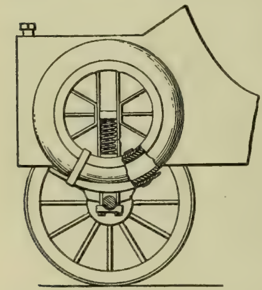
The rear seat of a touring car of British make is now being provided with an ingenious central arm rest, designed to increase the comfort of the users in that it provides a rest for both arms. It cannot, of course, be used when the rear seat is occupied by more than two persons, for which reason it is so constructed as to be quickly and easily detachable.

GETTING THE TIRE OFF THE GROUND

Two interesting methods of getting the pneumatic tire off the ground, so that it will not be subjected to wear and tear, yet will have the cushioning effect that makes such tires necessary, are shown in the accompanying drawings. One is a wheel within a wheel, the pneumatic tire being located between the axle and the wheel rim. Plunger heads bear upon the pneumatic tire. The other drawing shows another inventor's idea of how the pneumatic tire can be got off the road and yet be a shock absorber.



An Automobile Wheel with Pneumatic Tire Placed between the Hub and the Wheel Rim



'WAY FOR THE WEATHER WIRELESS!

Weather dispatches are now to have precedence over all commercial messages flashed by wireless throughout the Atlantic. This is the first actual step toward the proposed international weather and storm bureau which was recommended by the recent weather congress in London at the instigation of the American representatives. Heretofore weather and storm observations, when relayed from one ship to another, were often delayed while commercial messages were being transmitted. Thus, by the time the observations reached Washington they were so old as to be practically valueless in the preparation of the weather and storm charts. Under the new arrangement emergency calls and messages of warning are the only ones which are to be given precedence over the weather and storm observations.

Prof. Willis Moore, chief of the United States Weather Bureau, has recently pointed out an important feature of the proposed ocean weather service, additional to weather-reporting service by the regular transatlantic liners which was discussed in these pages in August. He believes that weather observations taken by tramp steamers sailing in those portions of the Atlantic not included in the paths followed by the steamers, which have set routes, will be of the greatest value when once the international weather and storm bureau is put into operation. Such observations will make it possible to prepare storm and weather charts for the entire Atlantic and will enable the weather bureau officials both in this country and in Europe to follow the paths taken by storms which are not in line with the so-called "northern" and "southern" transatlantic passages.

ℭA nine-word cablegram recently sent from New York to a Berlin electrical journal with the request to forward it around the world back to New York, reached its original sender after 16½ minutes, having passed 16 relay stations and been treated all the time as an ordinary message. Eleven years ago, when the transpacific cable was opened, a telegram was sent around the world in 9½ minutes, but every relay station was then prepared for its coming and immediate transmission.

Temporary Repair for Lead-Pipe Leaks

While excavating on city work a great deal of inconvenience is often caused by puncturing the lead pipes with the picks used by the workmen. As a temporary repair I have driven a wood plug into the hole tightly and calked the lead around it with a blunt tool. A pipe repaired in this way will be watertight and will stand the ordinary city-water pressure.—Contributed by N. W. Wickham, Norwalk, Ohio.

Tool-Width Gauge for an Anvil

A handy device for a blacksmith who has a number of different tool widths to forge and sharpen, such as rock drills and miners' tools, is a width gauge for the anvil. Such a gauge can be easily made of metal, 5/8 in. thick, 3 in. wide and as long as is necessary for the number of different widths. Notches are cut in the metal as shown in Fig. 1 for the different widths and then the metal is riveted to a U-shaped piece that fits over the soft part of the anvil. Its location for use is shown in Fig. 2. The gauge is easily slipped on and off the anvil.—Contributed by Thomas Bound, Rochester, N. Y.

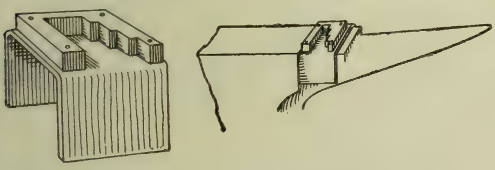
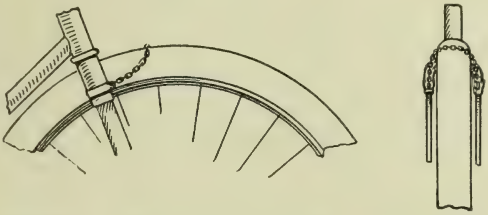


Fig. 1 Fig. 2

The Width of a Red-Hot Tool may be Easily Determined When Slipped into the Gauge

Preventing Tire Punctures from Glass with Chains

The greatest annoyance the bicycle rider has to contend with is the small particles of glass which cannot be seen and avoided but which are picked up on the tread of the tire and gradually pounded through, as the wheel revolves, causing a puncture. A careful examination will prove that glass rarely, if ever, punctures the tire the first time around. It is picked up on the tread and held and is gradually forced in as the wheel revolves.



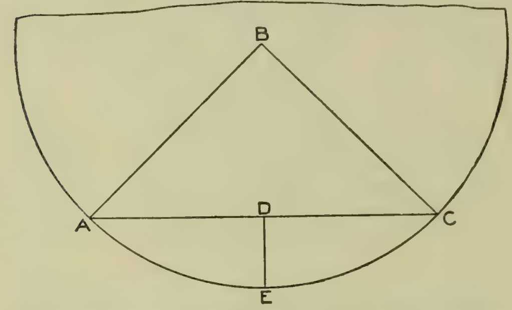
Particles of Glass are Removed from a Tire Casing by the Chain Before They Enter the Inner Tube

By attaching a piece of flat chain, such as used on the flush-water tank in bath rooms, to the front fork and rear frame in the manner shown in the sketch, so that it will lie flat on the tire, all small particles of glass will be pulled off as soon as they come in contact with the chain.

I have used the chain for about six months without having suffered a puncture, and my tires are absolutely free from glass cuts, proving that the chain pulls the glass out, in fact, never gives it a chance to take hold. The chain does not wear the tire a particle and it affords me a great deal of pleasure to watch it pull off anything that may be picked up while riding the bicycle. It is equally efficient for motorcycle and automobile tires. Care should be taken to have the chain rest immediately on top of the tire, so as to have it slide freely.—Contributed by Dr. Theodore F. Krey, Detroit, Mich.

To Quickly Find the Circumference of Any Circle

Mechanics often have need of ascertaining the circumference of a circle quickly. There are several rules for finding these figures but most of them require long and complicated calculations in fractions and decimals, which many have not the time or knowledge to use. I have found the following rule a quick and easy way for solving this problem correctly.



The Triangle as It is Laid Out on the Circle to Obtain the Circumference Quickly

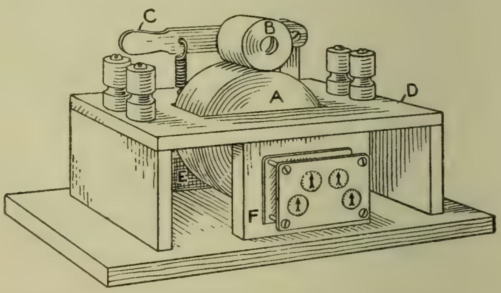
Lay out a circle having the desired diameter and place the corner of a square in the center and draw the lines AB, BC, and AC. Also draw the line DE, from center of line AC and at right angles to it, to the periphery of the circle. Three times the diameter of the circle with the length of the line DE added will give the desired circumference, as nearly correct as needed for practical purposes.—Contributed by R. Edwards, Portland, Ore.

Repairing a Broken Carborundum Wheel

A new carborundum wheel, 4 in. in diameter, had been broken and I repaired it successfully as follows: The pieces were placed together and chucked in a lathe, and a circular groove, about 1/8 in. deep and 2 in. in diameter, was cut in each side with an old file. The parts were then bound together with a wire, and removed from the lathe. A ring of fireclay, a little larger in diameter than the grooves, was placed flat on a board and melted babbitt poured in to fill the grooves and surface. This formed a flange on each side. The wheel was then returned to the lathe, the flanges faced off to 1/8 in. in thickness and the hole bored out to the right size. When the wheel was placed on the arbor the nut was drawn up firmly. The fracture is almost invisible.—Contributed by Samuel Hughs, Berkeley, Cal.

A Wire or Rope-Measuring Machine

A simple and very convenient wire or rope-measuring machine may be made as shown in the accompanying illustration. The wire or rope to be measured passes over the top of the main wheel A and is guided by means of the two upright rollers at each end. One of the rollers at each end may be mounted upon an adjustable base, which will afford a means of changing the distance between the rollers to meet the requirement, depending upon the diameter of the rope or wire being measured. It would, no doubt, be best to so arrange the adjustable bases that the movable rollers will be held against the others by a tension spring.



The Wire or Rope Revolves the Wheel That Records the Turns, as It Passes through the Machine

A second wheel, B, is mounted on a handle, or lever, C, which is pivoted at one end, as shown in the sketch. This second wheel normally rests upon the main wheel, A, but will rest upon the wire or rope being measured when it is in place on top of the main wheel. A small downward pressure should be exerted on the handle C when the wire or rope is being drawn along, in order that the main wheel always turn. This pressure can be easily supplied by a coil spring with one end attached to the handle C and the other end to the piece D.

The shaft of the main wheel A is supported by the two pieces, E and F. On the face of one of these pieces is mounted the gear train from an old electric meter. This gear train is mechanically connected to the axis of the main wheel in such a way that the indicator on the right-hand dial moves over one small division when the main wheel rotates once. Now, if the circumference of the main wheel has been made one foot, the readings on the dial will be in feet. The difference between the final reading of the dial and its reading when the measurement was started will be the length of the wire or rope measured. A small flange may be placed on each side of the main wheel which will aid in guiding the wire or rope. Such a device will be exceedingly useful and can be constructed at a very small cost.

Shade for Electric Sign Lights

Electric lights used in signs can be made more effective if each globe is inclosed in a bright reflector sleeve. These reflectors can be readily made of nickelplated sheet metal, cut as shown in Fig. 1 and bent to inclose the globe as in Fig. 2. The reflected rays from the globe are concentrated in one direction.—Contributed by S. Yamashita, Hoquiam, Wash.

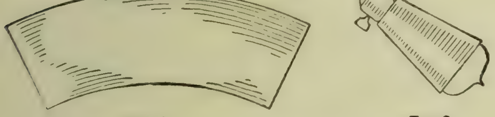
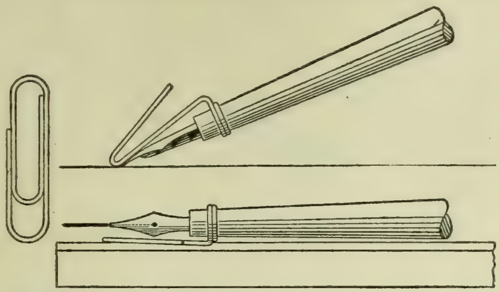


Fig. 1 Fig. 2

The Shape to Cut the Metal, and as It Appears When on the Globe

A Fountain Ruling Pen

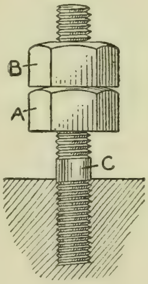
Having need for a straight-line ruling pen, I resorted to the use of a fountain pen and a paper clip as illustrated.


The Paper Clip Attached to the Pen to Keep the Pen Point Away from the Ruler Edge

The larger end of the clip was bent two turns around the barrel of the pen and the remainder of the clip bent to extend just beyond the end of the pen and then turned back as shown.—Contributed by E. C. Ramsey, Columbus, Ohio.

To Remove a Stud

A very effective way to remove a stud is shown in the accompanying sketch. Two nuts are turned onto the stud C; the wrench is placed on the nut A and turned to the left, the nut B locking A and keeping it from turning off. The stud may be turned in the opposite direction by applying the wrench on the nut B.—Contributed by Chas. T. Richards, Philadelphia, Pa.

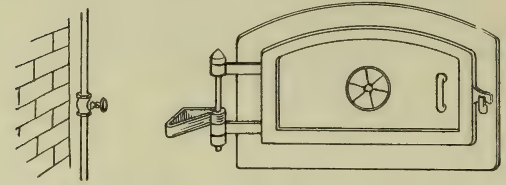


Protecting Switchboards When Drilling Them

Switchboard makers using hand drills for making odd holes will avoid marring the finished surfaces of the slates by slipping a cork on the drill against the chuck. This will serve as a cushion when the drill breaks through the slate.—Contributed by Edward Miller, Rochester, N. Y.

A Furnace-Door Buffer

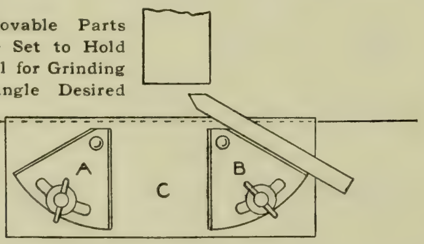
In the accompanying illustration is shown a triangle hung on a rod that carries the furnace door on a boiler front, and serves the purpose of keeping the door from swinging too far back. In our case, says a correspondent of Power, the drain pipe from the water column was run down a wall, but in the way of the door. The triangle was used to protect the pipe.



The Triangle Hung on the Hinge Pin Prevents the Door from Striking the Valve in the Pipe

Gauge for Grinding Threading Tools

The usual method of holding a lathe threading tool in the hands while grinding it will not always result in getting the proper angle. The emery-wheel rest is of some assistance, but I find that the rest attachment shown in the sketch aids a beginner in grinding a perfect angle. The angle pieces A and B are each pivoted to the base C, which has a projection shown by the dotted line to fit over the edge of the rest. The pieces A and B have a slot cut as shown for adjustment. These slots are fitted with bolts passing through the base C. Thumbnuts are provided for making the adjustment quickly.



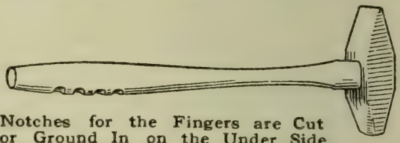
The Movable Parts may be Set to Hold the Tool for Grinding Any Angle Desired

Each edge of the parts A and B is turned up at right angles to form a surface for the tools being ground. The tool is placed as shown and the whole moved back and forth across the face of the emery wheel while it is turning.

The thumbnuts and slots provide a way to set the tool for grinding any angle desired. The pieces may be set with the aid of the protractor.—Contributed by F. G. Marbach, Cleveland, Ohio.

Grip on a Hammer Handle

Before using a new hammer I have always found it to advantage to cut one or two inches off the end of the handle and then round it well to keep the wood from splitting. If the hammer is to be used on greasy work, it is a good plan to grind a groove $\frac{1}{16}$ in. deep for each finger on the under side of the handle. This will make a grip for holding the hammer firmly.—Contributed by J. H. Maysilles. Rochelle, Illinois.



Notches for the Fingers are Cut or Ground In on the Under Side of the Handle

Cleaning Glass Gauges

One way of cleaning out the iron rust and calcium deposit in the glass tubes of water gauges on steam boilers is to use the following compound: An ounce of common soda is mixed with 3 or 4 oz. of vinegar and the glass tubes washed out with it. This compound is also good for removing flyspecks and grease spots from all glass articles. For grease it works better if a little salt be added to the solution.

The ingredients are cheap and the mixture harmless. The vinegar and soda should be mixed in a wide-mouthed jar, as otherwise the foaming will cause the solution to run over. As soon as the foaming ceases, the solution may be placed in smaller bottles for future use.—Contributed by Loren Ward, Des Moines, Iowa.

How to Make a Slide-Wire Bridge

By A. E. ANDREWS

The slide-wire bridge is a device for measuring the value of an unknown resistance in terms of a known resistance. The bridge in its simplest form is nothing else but a divided circuit, and its operation can be easily understood by studying the relation between the current through, and the drop in electrical pressure over, the various parts of a divided circuit.

Two unequal resistances, AB and CD, are shown connected in parallel in Fig. 1, and this combination is then connected in series with the battery through the switch E. The drop in electrical pressure across the upper branch AB of the divided circuit is equal to the drop across the lower branch CD, when the switch E is closed, and this drop remains constant provided there is no change in the pressure supplied by the battery. The drop in pressure over a certain part of AB, say, of a resistance of one ohm, is not the same as the drop over a like portion of CD, because the current in the two branches is not the same, due to their being of unequal resistance.

Assuming that the current passes through AB and CD in the direction indicated by the arrows in Fig. 1, then the right-hand end of the two branches will be at a lower pressure than the left-hand end, and any point on AB to the right of A, and any point on CD to the right of C will be at a lower pressure than the left-hand ends. If a point on the upper branch, such as F in Fig. 1, be selected, it will be lower in pressure than point A, say, two volts, and a corresponding point on CD, as point G, can be found between which and the point C there will also be a difference in pressure of two volts. The point G on CD can readily be found by connecting one terminal of a galvanometer to the point F and moving the other terminal along the branch CD until there is no deflection of the galvanometer needle when its circuit and the switch E are both closed.

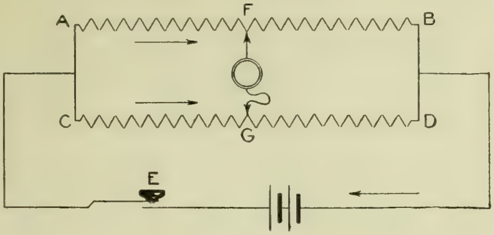
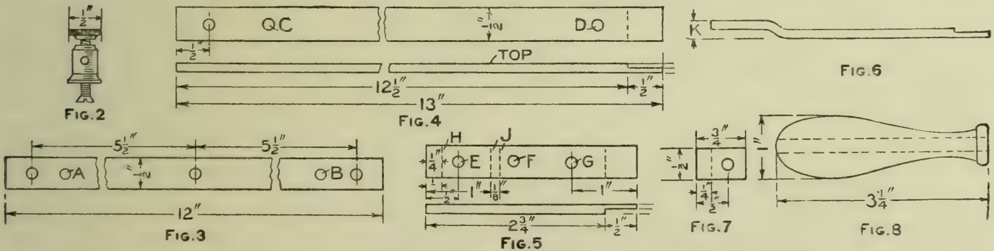


FIG. 1

Diagram of Two Unequal Resistances Which are Connected in Series with a Battery



Details of the Parts for the Construction of the Slide-Wire Bridge. The Parts may be Made of Brass or Copper Cut to the Dimensions Given

When there is no deflection of the galvanometer needle there is no current through it, and, hence, the two points F and G, to which it is connected, are at the same potential. These two points may be connected by an electrical conductor and there will be no flow of current in the conductor, nor will the current in any part of the circuit be disturbed by connecting the two points. When a balance of the galvanometer is thus obtained, the drop in pressure over AF is equal to the drop over CG, and the drop over FB must therefore be equal to the drop over GD. The ratio between the drop over AF and FB is the same as the ratio between the drop over CG and GD. The current in both parts of the upper branch is the same, as there is no current through the galvanometer circuit, so that, as a result, the same relation exists between the two resistances AF and FB as exists between the drops over them. The same holds true for the lower branch, when there is no current through the galvanometer, and we can say the resistance AF is to the resistance FB as the resistance CG is to the resistance GD.

This statement written in the form of an equation will appear as follows:

$$\frac{AF}{FB} = \frac{CG}{GD},$$

or it may be written in the following form without changing its numerical value

$$\frac{AF}{CG} = \frac{FB}{GD}.$$

For example, if the resistance in CG is 4 ohms, the resistance in GD is 12 ohms and the resistance in AF is 3 ohms, when a balance is obtained, then the resistance in FB must be 9 ohms because it must bear the same relation to AF, as GD does to CG. This relation of resistances required to give a balance of the galvanometer, makes it possible to measure an unknown resistance, such as FB, in terms of the resistance AF by moving the galvanometer connection along the branch CD until a balance is obtained. After a balance has been obtained, the values of the three resistances AF, CG and GD can be substituted in either of the above equations, and the resistance of FB determined.

In what is termed the "slide-wire bridge," the resistances CG and GD are nothing more than a piece of wire stretched between two binding posts. The point G is a sliding contact arranged so that it may be shifted from one end of the wire to the other. Now, if this wire be of uniform cross section, the same relation will exist between the resistances of various portions of it, as between the lengths of these respective portions. In the operation of the bridge, the relation between the resistances CG and GD is expressed in terms of the lengths of wire between the points C and G, and G and D. Hence in order to determine the value of the unknown resistance, such as FB, it is only necessary to know the value of the resistance AF. The resistances CG and GD are called the "ratio arms" of the bridge because the relation between them is the relation between the known resistance AF, which is called the "rheostat" of the bridge, and the unknown resistance FB. The ratio arms are usually designated by the letters A and B, the rheostat by the letter R, and the unknown resistance by the letter X.

A simple slide-wire bridge may be constructed as follows: Procure a piece of well-seasoned hard wood that is to serve as a base for the bridge, 44 in. long, 6 in. wide and 7/8 in. thick. Dress both sides of this board with a smoothing plane, round off the corners on one side, and sandpaper it until perfectly smooth. Then give the board at least three coats of shellac, allowing each coat ample time to dry. It would be best to rub the surface with a piece of very fine sandpaper after the first and second coats have thoroughly dried. If the wood used has an open grain, it should be given a coat of wood filler before being shellacked in order to give the best results.

The electrical connections on the bridge should be of low resistance, so that they will introduce only a very small error in the measurements, and for this reason must be made of a material having a rather low resistance and should have a large cross section. Obtain a piece of brass or copper, approximately 1/8 in. in thickness, 1/2 in. wide and about 48 in. long, also ten back-connected brass binding posts similar to the one shown in Fig. 2. Cut from the strip of brass or copper a piece 12 in. long. Drill three holes in this piece, one in each end and one in the center, as shown in Fig. 3, to be used in mounting three binding posts. Drill two other holes, A and B, to be used in mounting the strip on the

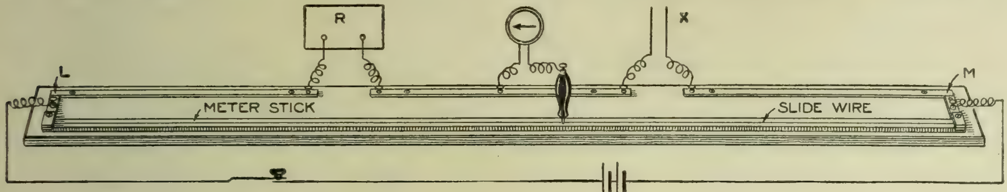


Fig 9

The Parts as They are Attached to the Base with the Meter Stick and Slide Wire. Connections are Shown for Placing the Unknown Resistance in a Circuit with a Known Resistance to Obtain Its Value

wooden base, which will be described later. Cut off two other pieces 13 in. long. File away part of one end of each of these pieces as shown in Fig. 4. Drill a hole for a binding post in the end opposite the one filed, and drill two holes, C and D, in each piece to be used in mounting. Cut off two other pieces 3¼ in. long. File one end of each of these pieces as shown in Fig. 5, so that they will fit into the notch cut in the two pieces just finished. Drill a hole E in the end of each of these pieces, opposite the end in which the notch is cut, and tap it to take a small machine screw. Hole F is to be used in mounting the strip upon the base, and a binding post should be mounted at the hole G. Cut off two other pieces ¾ in. long, and drill a hole in each of them as shown in Fig. 7. These holes should be large enough to allow the screws in hole E, Fig. 5, to pass through them. Now cut a very small groove with the corner of a file, across the end of the 3¼-in. pieces on the upper side. The location of this groove is shown by the dotted line H, in Fig. 5. A small groove should also be cut in the two small pieces, as shown by the dotted line in Fig. 7.

Now obtain a good meter stick and mount it on the wooden base with several flat-headed brass screws, countersunk so that their heads are level with the surface of the stick. Take the two 3¼-in. strips, or end connecting strips, and bend them at the dotted lines J, Fig. 5, forming two pieces similar to that shown in Fig. 6. The dimension K in Fig. 6 should be equal to the thickness of the meter stick.

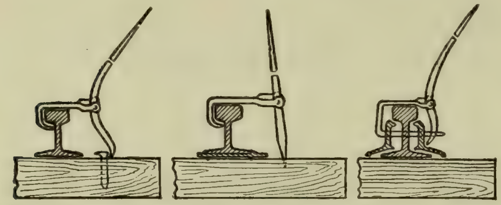
The two 13-in. pieces (Fig. 4) should now be soldered to the 3¼-in. pieces (Fig. 5), so as to form two right-angled pieces as shown by L and M in Fig. 9. These should now be mounted on the base by means of round-headed screws as shown in Fig. 9. The grooves H should be opposite the centers of the ends of the meter stick. Then mount the 12-in. or center connecting strip so that the gaps between its ends and the ends of the corner strips are equal in length.

The slide wire itself should be made from a piece of german silver or manganin wire, as the resistance of such a wire is greater than that of copper wire of equal dimensions and it will stand more mechanical abuse than the copper wire will. There will be required about 42 in. of wire and it should be about No. 22 gauge without any insulation. The wire can be clamped in position on top of the meter stick, and the bridge is complete with the exception of a sliding contact for connecting the galvanometer to the slide wire.

A very simple sliding contact can be made by mounting a piece of brass on a small wooden handle, the electrical connection to the piece of brass being made by means of a small binding post attached to it. The piece of brass should have its edge sharpened so that it will make contact with a definite point on the slide wire. The following description of how to build a simple contact may be of value to some readers. Cut out a round wooden handle similar to that shown in Fig. 8. Drill a ¼-in. hole through this handle lengthwise. Obtain a piece of ¼-in. round brass rod, about 1¼ in. longer than the handle. Mount a small binding post on one end of this brass rod, then shove the other end through the hole in the handle until the base of the binding post is even with the large end of the handle and fasten it in place. File the projecting end of the brass rod so that it is wedge-shaped, and the contact is complete.

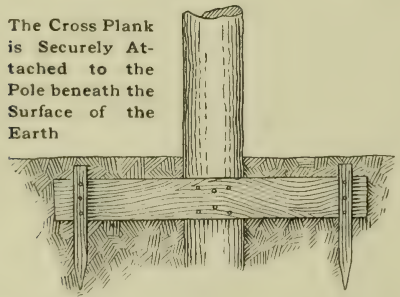
A Bar for Railroad Work

The rail bar shown in the sketch has been found to work effectively and to save much labor as well, says Railway Age Gazette. It is made in three types, as shown. The bar at the left is used to force the rail into place against the spikes when renewing a rail. The form in the center is used to hold the rail to gauge where tie plates are being applied or where there are no spikes in the ties, while the one at the right is employed to draw the angle bars into position in order that the bolts may be easily applied.


The Three Types of Bars in Use on Rails, Showing Their Application in Each Case

A Brace or Anchor for a Pole

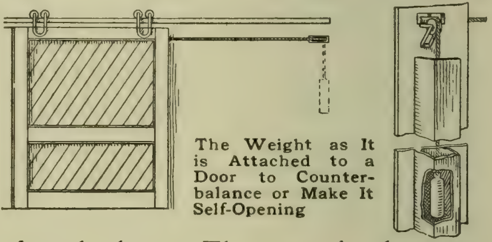
Many times I have been forced to use an anchor and wire to a guy pole on a slight curve. The extra work of putting in an anchor added some little expense to the setting of the pole. After trying different methods to eliminate the extra cost, I finally succeeded by using the brace shown in the sketch.


The Cross Plank is Securely Attached to the Pole beneath the Surface of the Earth

After digging the hole for the pole, a trench is dug across it to receive a board or plank. Two stakes are driven in the earth at the ends of the plank, and the plank is securely spiked to both stakes and to the pole. The earth is then tamped in solidly about the plank and pole. This simple anchor will stand considerable strain on the pole at the top. Such an anchor is very appropriate for fences, clothesline poles, telegraph and telephone poles.—Contributed by Harry Fritzinger, Decatur, Ind.

Counterbalancing Rolling Doors

The heavy doors of a carriage house, barn or garage may be so constructed that they will be practically self-opening when the latch is released. A ½-in. pliable rope is fastened to a staple driven into the top of the outer edge of each door. The rope is then run parallel with the track to the point reached by the edge of the door when open. At this place a rectangular hole is cut in the wall and the rope run over two pulleys so arranged as to turn it in a downward course, as shown by the dotted lines in the sketch.


The Weight as It is Attached to a Door to Counterbalance or Make It Self-Opening

The weights attached to the ends of the ropes may be just heavy enough to counterbalance the doors or they may be of such a weight that they will draw the doors open when the latch is disengaged.

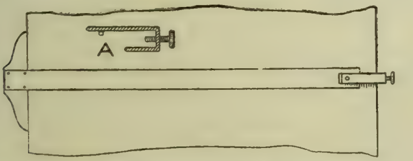
When the doors are made self-opening they are closed by first drawing one door shut and fastening it with a foot latch, whereupon the other door is drawn closed and both doors latched with the hand latch. The foot latch is then released. A line may be attached to the hand latch and the end extended to some place within the building or outside as desired, so that a pull on the rope will release the latch and allow the door to open.—Contributed by J. G. Allshouse, Avonmore, Pa.

Preserving Extra Door Keys

It often happens that a key for a door is lost and if the extra key cannot be found a new one must be fitted which involves the removing and taking apart of the lock. New locks are always supplied with two keys and if the extra keys for all doors are kept together no trouble will be experienced when a key is lost, but this is seldom the case. A still better way is to have a carpenter, when fitting the new door in its place, cut a small mortise or depression in the top edge of the door just large enough to hold the extra key. Put the key in this place and it can always be found when needed.—Contributed by Bert R. Libe, Platte, S. D.

T-Square Clamp for a Drawing Board

Where it is necessary to hold a T-square in one position on the drawing board for any length of time, the clip A, shown in the sketch, is a good device to clamp it perfectly horizontally across the board. The clamp consists of a piece of steel, 1/8 by 3/4 by 4 1/2 in. The metal is bent into U-shape, with one leg longer than the other, and fitted with a screw and pin, as shown.

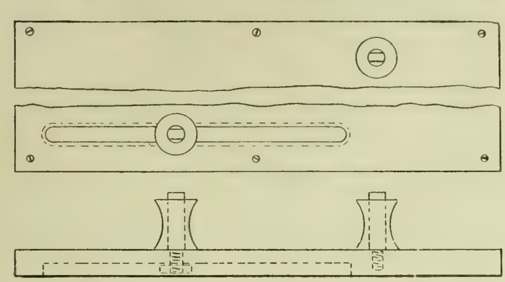


The Shape of the Clamp and Its Application to a T-Square and Drawing Board

The clamp is easily applied to the T-square.—Contributed by Egner Christensen, Montrose, Iowa.

Pipe-Bending Rolls

The pipe-bending device shown in the sketch is made as follows: The flat base plate is made of cast iron, 10 in. wide by 18 in. long and 1 1/2 in. thick. A slot, about 7/8 in. wide, is cut into the plate and recessed at the bottom so that a nut will slide in it. The roll-holding studs are made of 1 1/4-in. steel, turned down at one end to 7/8 in. to fit through the slot and also to screw into the plate and the nut respectively. The other end is filed square for turning with a wrench.



The Cast-Iron Base Carries Two Rollers, One Stationary and the Other Adjustable

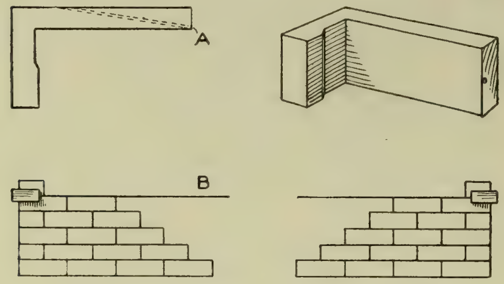
The rollers are of cast iron, bored to a loose fit on the studs and turned concave on the surface to fit a 2-in. pipe. This size of rollers will bend pipe from 1 to 2 in. in diameter without kinking the metal. For pipe smaller than 1 in., another set of rollers must be made to fit a 1-in. pipe. The whole device can be fastened to a bench with large screws. The adjustable roller makes it possible to bend pipes in many different curves.—Contributed by Geo. Hauley, Newburg, New York.

Removing a Damaged Round-Head Screw

When asked to remove a number of round-head screws from the timing-gear case of a motorcycle, I found that the slots in the screw heads were in bad shape, so much so that they could not be removed with a screwdriver. I filed two sides of each screw head flat so that the surfaces were parallel, and removed the screws with a pair of pliers.

Line Holder for Bricklayers

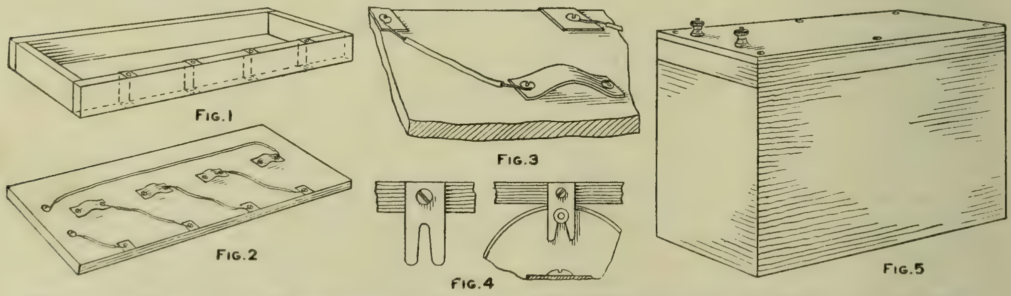
In building a wide chimney or mantel a bricklayer attaches the string used for keeping the work straight to nails that are pushed into the mortar between bricks. The illustration shows a very convenient way of holding the string without nails. Two wood blocks are cut as shown and a hole, A, bored on an angle to receive the end of the string. A block is placed on each end of the string and fastened so as to draw the string tightly when in place on the work. The string B is held tightly when the blocks are slipped on the corner bricks.—Contributed by C. R. Poole, Los Angeles, Cal.



The Line Stretched Tightly between the Blocks Keeps Them in Place on the Bricks

A Multiple-Battery Box

The main feature of this box is the connections on the cover. The box is of a size to hold four dry cells and when the cover is fastened down all the cells are connected to the binding posts. Four strips of copper are attached to the skirt of the cover, as shown in Fig. 1. These copper strips, when the cover parts are fastened together, form connections which are attached in multiple as shown in Fig. 2. Each piece at the edge of the cover is connected to a strip of copper, centrally located on the board, as shown in Fig. 3.



The Connections are So Arranged on the Box Cover That When the Cells of Battery are in Place the Closing of the Cover will Form Connections to the Outside Binding Posts

When the cover is closed, the strips of copper (Fig. 1) come in contact with the U-shaped pieces fastened with screws to the box sides, as shown in Fig. 4. The binding post attached to the zinc of a cell is slipped into the U-shaped piece and fastened. The middle strip of copper on the cover (Fig. 3) comes in contact with the carbon top of the cell. The complete box is shown in Fig. 5.

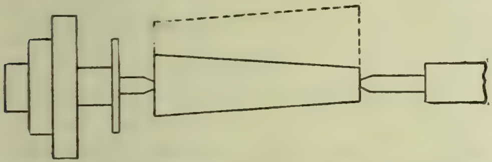
The cells are easily fastened to the U-shaped pieces (Fig. 4), and when the cover of the box is closed, a complete circuit is formed with the binding posts on top (Fig. 5) for connection to the system where the battery is to be used.—Contributed by Edwin Marshall, Oak Park, Ill.

Lustrous Black on Brass

Dissolve freshly precipitated carbonate of copper, while moist, in strong liquid ammonia, says Metal Industry, using so much of the copper salt that a small excess remains undissolved or, in other words, that the ammonia is saturated with copper. The method recommended for preparing the carbonate of copper is to mix hot solutions of equal parts of blue vitriol (sulphate of copper) and sal soda (sodium carbonate), filtering off and washing the precipitate. Dilute the solution of copper salts in ammonia with one-fourth its volume of water, add 1 oz. of black lead, and heat to about 100 deg. F. To prepare the work, cut down on a hard wheel, wash out in a potash solution, and run through the solution described until the article becomes black.

Setting Lathe to Cut Standard Tapers

On lathes not having the standard tapers marked in thousandths of an inch it is necessary to determine the correct position of the tool in reference to the piece cut. A quick way to determine this is to place a drill or sleeve having the desired taper in an end-reversed position as shown, and caliper the two ends. The end having the largest measurement must be thrown nearer to the cutting edge. This should be done as soon as one full cut has been taken over the work.—Contributed by Jas. S. Frear, Sidney, New York.

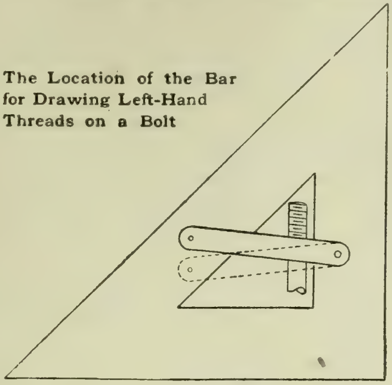

A Piece Having the Desired Taper is Placed Against the Piece being Cut and Both Ends Calipered

Soft Solder for Tightening Machine Parts

It is not generally considered workmanlike to use soft solder in connection with machine parts, but an exception may be made in tightening up the parts of loose fixtures. For example, if the driving gear on the spindle of a lathe is so light that it does not afford a good support for the key, the gear, key and spindle may be tinned and heated sufficiently to melt the solder which sweats the parts solidly together and holds the gear firmly in its place. Such a job will last almost as long as the various parts and will save all the lost energy and wear that accompany loose, rattling machinery.

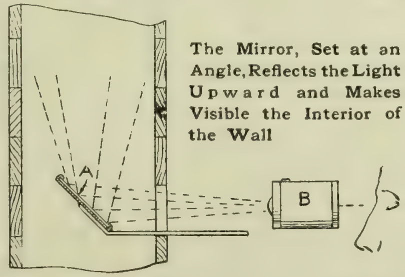
Triangle for Drawing Threads

A centerline is drawn on an ordinary triangle and a bar pivoted on the line at the lower edge. Two holes are drilled on the upper part, 4 deg. on either side of the centerline. A pin is stuck through the bar and triangle to hold them together, and the position of the bar is changed according to whether right or left-hand threads are to be drawn.—Contributed by J. F. Tholl, Detroit, Mich.


The Location of the Bar for Drawing Left-Hand Threads on a Bolt

How to Examine the Interior of Open Walls

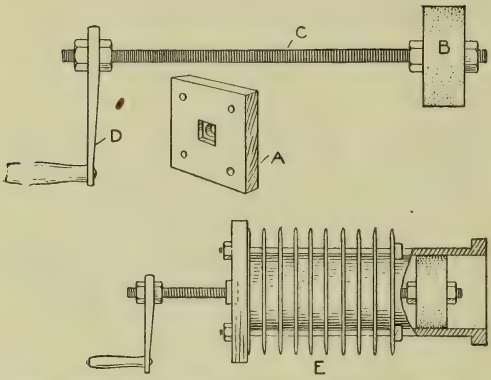
A very simple and effective way of investigating the interior of an open wall or partition which would ordinarily be inaccessible is shown in the accompanying illustration. This simple use of a small piece of mirror, A, mounted on a specially constructed handle together with an ordinary pocket flash lamp, B, is a great labor-saving device in inspecting electric wiring and plumbing. The mirror is introduced into a small opening, the lamp and the observer's eye being in a position similar to that shown in the



The Mirror, Set at an Angle, Reflects the Light Upward and Makes Visible the Interior of the Wall sketch. The light from the lamp is reflected from the mirror upon the place to be illuminated and at the same time the image of the object or wall is reflected back to the eye.

Truing up the Bore in Motorcycle Engines

Most repairmen whose shop is not equipped with the proper tools, will find it a most difficult job to bore true a motorcycle cylinder that is worn a little out of round or has carbon or sand scratches on the walls, causing a loss of compression.



Reboring by a Hand-Turning Grinding Head, Temporarily Attached to the Cylinder

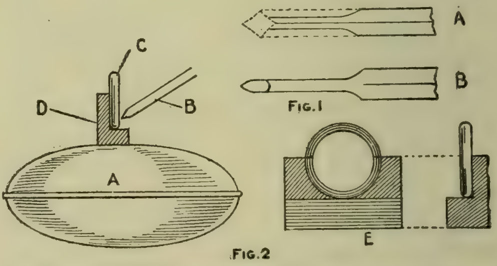
It is very easy, however, to true up such cylinders with the use of a homemade grinding device as shown in the sketch. The device is constructed as follows. Procure a hardwood block, A, slightly larger than the outside diameter of the fins on the cylinder, and lay out the bolt holes of the head on the block. Drill the holes about ¼ in. larger than the cylinder bolts. Drill a ½-in. hole in the center and with a chisel cut a square hole ¼-in. deep for the feed nut. Turn up a hardwood block, B, 2 in. thick, the exact size of the bore and drill a ½-in. hole through its center. Procure a piece of shafting, about 3 in. longer than the cylinder, also five ½-in. square nuts and four bolts the size of the cylinder bolts, or a trifle smaller, and as long as the entire number of fins plus the thickness of the block A.

The grinding block B is fastened to the end of the screw by means of two ½-in. nuts. Fasten the block A to the cylinder as shown at E, and place the nut on the screw in the square hole cut in the center of the block A. Fasten the nut to the block with nails. A crank, D, is attached to the outer end of the screw with two nuts.

Fine emery and oil are applied to the surface of the wood block B and cuts are taken by turning the screw back and forth in the cylinder. As the turning proceeds, the oil-soaked block will swell slightly and become of sufficiently increased size to do the grinding. After two or three cuts are taken, rinse out well with gasoline.—Contributed by Joe V. Romig, Allentown, Pennsylvania.

Engraving on the Inside of Finger Rings

The square graver, ground as shown in Fig. 1, is recommended by the author of "The Art of Engraving," as the correct tool for engraving the inside of rings. A represents the graver in its ordinary form, and B as ground for this purpose. The object of grinding a graver in this shape is, that when the graver is thrown out, or when it is curved around to the right or to the left to complete a loop, coming in contact with the edge of the ring will not mar it; and also so that it can get just as much nearer the completion of a loop in making the curve to the right or the left as the amount that has been cut off from the sides. A graver ground in this shape can be used inside the average width of oval wedding rings to make



The Shape to Grind Engraving Tools and the Manner of Holding the Rings While Doing the Work any loop or even to cross a T or make the bottom of an L.

Students in the art of engraving often practice inside-of-ring work by placing the ring in a holder, which is furnished with some makes of engraving blocks. Beginners should dispense with all such devices. Very few, if any, good engravers hold a ring in any other way than in their hand and on the sandbag pad when cutting it. At Fig. 2 are shown the pad, A; graver, B; ring, C, and block, D. The little block shown at D, a side view of which is shown at E, is made of soft wood about 1 in. long, and other proportions accordingly, with a semicircular opening in the top to admit light on the work. When engraving inside a ring with the aid of this block the operator would look in the direction the engraving tool B, Fig. 2, points. The little block of wood is so near the size of the ring that the thumb and finger pressing down against the edge of it will also strike against the ring. The object of using this block is to hold the ring more securely by increasing the amount of friction on the pad. The graver is shown at B. It works, of course, in the opposite direction from the point of vision. A little block of this description will suffice for holding any size ring, and a great many engravers find it helpful, but with a little practice little trouble will be experienced in cutting the ring directly on the pad, holding it between the thumb and index finger of the left hand.

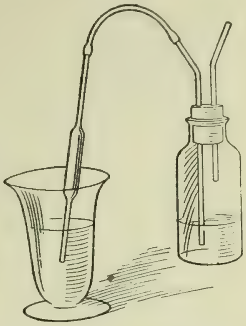
A Paste to Use in Damp Places

Use good wheat flour, dampen and beat smooth, then add boiling skimmed milk instead of boiling water, and stir into the flour. After the paste is cold, thin with water and strain it. This paste can be used with good results in damp places.—Contributed by Fred L. King, Islip, N. Y.

ℭA fine brass-wire mesh placed over the air inlet of the carburetor and breather pipes, will keep out a large portion of the grit and dirt.

Flowing Chemicals by Suction

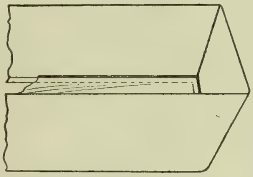
It is sometimes both disagreeable and dangerous to use a pipette in the ordinary manner for the purpose of moving measured quantities of some solution from one container to another in the laboratory.



The sketch shows an apparatus by means of which the pipette may be filled at a safe distance from the fluid, to be sucked into the pipette, whether this fluid be of such a nature that it would cause injury if sucked into the mouth, or its fumes be disagreeable or noxious. The construction and operation of the apparatus is self-explanatory. A valve or stop can be placed in or on the tube for regulation if desired.

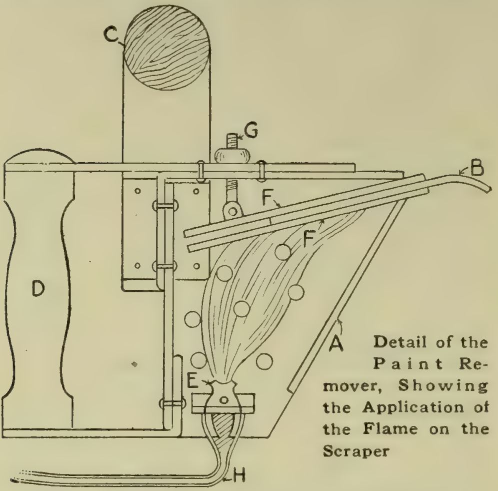
Glass Bottom for a Cake Pan

Cut out the bottom in an ordinary pan, leaving about $3/8$ in. of the metal around the edges. Cut a piece of glass the size of the bottom in the pan and grind the edges to prevent cutting the hands. The glass bottom in the pan makes it easy to examine the cake while it is baking. After trying out this method, we found it much more satisfactory than the old way.—Contributed by W. Crane, Cleveland, O.



To Remove Paint or Enamel From Metal

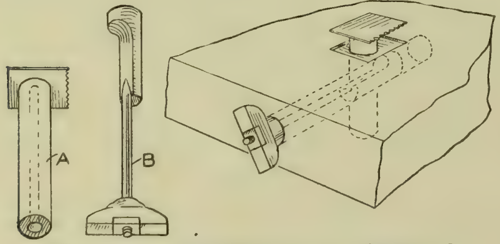
For the removal of paint or enamel from large metal surfaces, for which work either the blowtorch or a special chemical lye is usually employed, unless a sandblast is available, a method is recommended by a German technical magazine which is said to offer the advantage of always leaving the metal surface uninjured and in suitable condition for a new coat of paint. It also is less messy than other processes; develops no fumes, and may be carried on at any place in a factory and by unskilled workers. It consists simply in using a heated scraper. In the accompanying illustration A represents the sheet-iron boxing; B, the scraper; C and D, the handles for operating the tool; E, a gas-flame jet; F, guide irons for holding the scraper; G, a screw and nut for adjusting the angle of the guide irons; H, a flexible tube to the gas supply. Holes are cut in the side for ventilation.



Detail of the Paint Remover, Showing the Application of the Flame on the Scraper

A Homemade Bench Stop

An easily operated stop for a workbench is made as follows: The main piece A consists of a round piece of wood, 1 in. in diameter and 4 in. long, through the center of which passes a rod with a piece of saw blade riveted to the top end and a washer on the bottom.



The Parts of the Stop and the Manner of Attaching Them to the Bench

The part B is a ⅜-in. bolt, 6 in. long, with a round piece of wood shaped as shown on the head end, and a thumb nut for the threads. Two holes are bored into the bench top to receive these parts. The illustration clearly shows how they are used.—Contributed by A. S. Thomas, Gordon, Ont.

Finding the Contents of Concrete Walks

The contents of concrete walks and the amount of cement, sand and gravel necessary to the cubic yard may be found by using the following rule: The width of the walk multiplied by its length, both measured in feet, equals the surface. The surface multiplied by the depth in inches and divided by 12, gives the total contents in cubic feet. The number of cubic feet divided by 27, equals the cubic yards of material in the body of the walk.

For example, find the surface and cubic contents of a walk 5 ft. wide, 100 ft. long and 4 in. thick.

5 x 100 = 500 sq. ft. of surface.
500 x 4 = 2000 ÷ 12 = 166⅔ cu. ft. in the body of the walk.
166⅔ cu. ft. ÷ 27 cu. ft. = 6.17 cu. yd. in the body of the walk.

The amount of the various materials may be ascertained by the following method. Add together the numbers indicating the proportions of the materials to be used in the mixture, and divide 40 by this sum. The quotient will equal the number of 100-lb. bags of cement needed for each cubic yard. The number of sacks of cement multiplied by the number of parts of sand and gravel will give the number of cubic feet of each per cubic yard.

For example, the mixture is to be 1 part cement, 2 parts sand and 4 parts gravel. The sum of these three is 7.

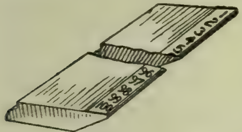
40 ÷ 7 = 5.71 bags of cement to each cu. yd.
5.71 x 2, proportion of sand = 11.42 cu. ft. of sand per cubic yard.
5.71 x 4, proportion of gravel = 22.84 cu. ft. of gravel per cu. yd.

—Contributed by Geo. M. Petersen, Buffalo, N. Y.

Magnetized Tack Puller

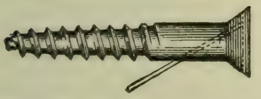
Magnetize the tack puller by rubbing it on a horseshoe magnet, or by wrapping several turns of insulated wire around it to form a coil and attach a battery to the ends of the wire and allow the current to pass through the wire for several minutes. A magnetized tack puller will hold the tack and prevent its being thrown from the board.—Contributed by Theo. A. Oberhellmann, St. Louis, Mo.

An Account Counter



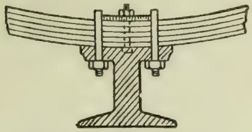
The total number of accounts in a banking business must be counted and tallied occasionally, as well as the number of checks, which is a tedious task. The time of doing this may be greatly reduced by using the little device shown in the sketch. Figures from one to one hundred were printed on a strip of paper by using the adding machine and the paper trimmed close to the figures. The strip was then pasted on the back of a ruler. The ruler placed on an account easily indicates the number of checks written.—Contributed by Maurice Baudier, New Orleans, La.

A Wood-Screw Lock



It is sometimes desired to so set a common wood screw that removing it is made very difficult if not impossible. One way of doing this is to drill a small hole at an angle through the head and body of the screw as shown in the sketch and driving a brad through the hole and into the wood. If the hole in the screw head is countersunk to allow the head of the brad to sink flush with the bottom of the slot, it becomes practically an impossibility to remove the screw.—Contributed by R. F. Pohle, New Haven, Conn.

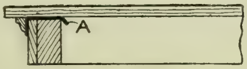
To Prevent a Spring from Slipping



Quite often it is almost impossible to keep automobile springs, and especially those on the front axle, from slipping on the axle, no matter how tightly the clamps are drawn. This can be overcome by cutting a piece of spring the same width as the automobile spring and just long enough to fit snugly between the clamps and fastening it in place with the same bolt that passes through the spring.

The piece of spring rests against the clamps on either side and prevents the spring from shifting on the axle in case the clamps come loose.

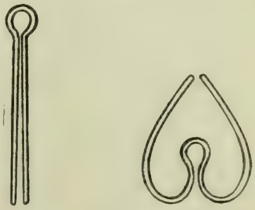
Protecting Sills from Rot



While repairing a decayed sill under the porch of an old house I found a strip of asphalt roofing covering the top of the sill for about 4 ft. The covered part of the sill was perfectly sound. When the new sill was in place, it was covered with a strip of two-ply asphalt roofing as shown at A in the sketch.

Any sill or part of a building that is exposed to dampness or located in a place where it is liable to rot can be effectively protected in this manner.—Contributed by Geo. Monson, Deposit, New York.

A Tool-Check Ring



An effective substitute for a key or tool-check ring can be made by selecting a cotter of suitable size and spreading the parts until the two ends meet as shown in the sketch. This makes a strong ring. — Contributed by A. Clifton, Chicago, Illinois.

Various Methods of Fitting Hinges

The three types of hinges shown in Fig. 1 are those most commonly used. They may vary in size and details, but not very much in their proportions, says Building News. The shape of the butt-hinge adapts it for attachment to narrow edges of wood, as those of doors and box-covers. The length of its pivot or knuckle is greater than the extension of its flaps.

In the back-flap hinge these proportions are reversed, the length of the knuckle being less than the measurement across the flaps. This type of hinge is used on broad surfaces, and chiefly for a rougher class of work than butts.

The tee-hinge is used similarly, its extremely long extension serving as a brace and stiffener to a broad surface of comparatively thin wood.

The butt-hinge, Fig. 2, is generally sunk into the wood, but not necessarily so. As far as hinging of the parts is concerned, the effect is the same, whether it be screwed on the outer surface, as in Fig. 3, or inside of the joint, as in Fig. 2, but a back-flap hinge is more suitably proportioned for such a position.

When a butt-hinge is used, as in Fig. 2, long screws can be inserted, and there is no risk of their tearing out, or of the wood breaking away. If it is attached as in Fig. 3, the screws are rather close to the edge, and the strain on the hinge tends to split the wood. For this reason a back-flap, or a tee-hinge, as in Fig. 4, is preferred for attachment to the outer surface. The former is occasionally sunk flush with the surface, but the latter never is, being simply adjusted in the required position and screwed on.

The butt-hinge, used in Fig. 2, must be sunk, in order to make a close joint between the hinged parts, but when the hinge is placed as in Figs. 3 and 4, its thickness does not interfere with the closeness of the edge joint, but only with the closeness of the broad surfaces, when they are folded back against each other.

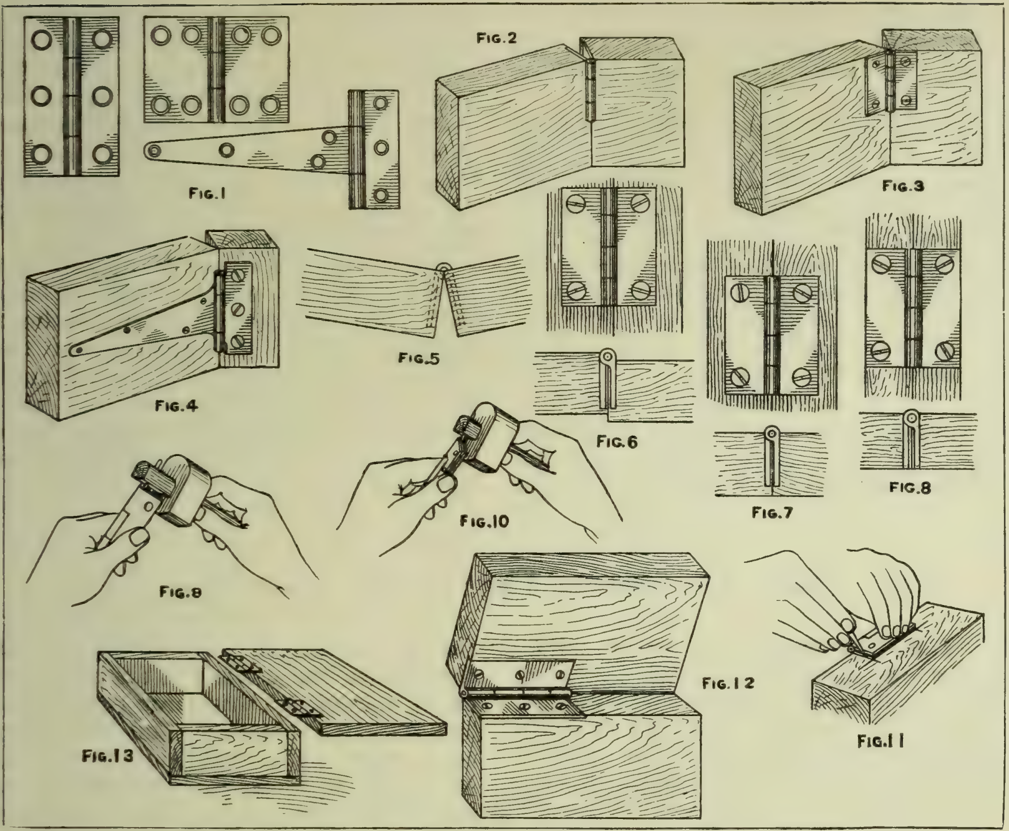
Generally it is easier and quicker to attach a hinge as in Fig. 3 than in Fig. 2. The parts to be hinged simply have to be placed in position, with their edges in contact, and the hinges screwed on, care being taken to set their knuckles central over the joint. In many cases the parts can be laid flat on a bench while this is being done.

If the hinges are to be sunk flush with the surface, they are laid in position, lines marked around them, and the recesses chiseled out to correspond with the thickness of the flaps. Then the hinges are inserted and fastened with screws.

In attaching butt-hinges, as in Fig. 2, the procedure is not quite so simple, for the parts can seldom be placed as conveniently. The hinges must be fitted to one of the parts first, and this held in position for attachment to the other.

Hinges must be sunk to exactly the right depth or the joint will either be open, or it will bind and not close properly. This latter defect is shown in Fig. 5. The hinge shown is sunk too deeply, and the edges of the wood, at the knuckle, bind and prevent the farther edges from coming into contact. The joint might be closed completely by the use of force, but it would spring open again as soon as released. The remedy is to take the hinge off and replace it with cardboard packing beneath, or plane the wood down to reduce the depth of the hinge recesses.

Another defect is shown in Fig 6. This hinge is sunk correctly, but is out of center. In the view showing this hinge open, the center line of the knuckle is to one side of the joint. The consequence is that the surfaces of the parts are not flush with each other when the hinge is closed. Butt-hinges attached correctly are shown in Figs. 7 and 8. In Fig. 8, the hinge is the full width of the wood, in Fig. 7 it is less, and the recesses are, consequently, not cut fully across. The neatest and most frequent method is shown in Fig. 7, but when the wood is



Hinges and Their Application to Box Covers, Cabinet Doors and House Doors. Defects and Their Remedies and Manner of Gauging

thin the hinges sometimes have to correspond with it, as in Fig. 8.

In other cases, where thin wood is hinged to a thicker piece, a combination of methods is followed, one flap of the hinge extending the full thickness of the wood, and the other having wood extending beyond it.

The flaps of a hinge have to be sunk slightly more than their thickness, in order that the wood may make a close joint when the hinge is closed. This is because the flaps are always made thinner than half the diameter of the knuckle.

When a hinge is closed, with the flaps parallel, there is a space between them about equal to the thickness of one flap. This space must exist when the hinge is fitted, but the wood should form a close joint, as shown in Figs. 7 and 8.

The correct depth for the recesses is marked on the wood with a gauge, which is set as in Fig. 9, to the center of the knuckle. When this has been gauged on the wood, the measurement in the other direction is taken, as in Fig. 10, from the outer edges of the flaps to the center of the knuckle. The length of the hinge is marked, as in Fig. 11, by laying it in position on the wood.

When hinges are simply screwed onto the surfaces without being let in, no gauging or marking is necessary, except measuring with a rule to get the distances uniform. They are placed in position, screw holes bored with a bradawl and the screws inserted.

Box covers are hinged as shown in Fig. 12, one flap of the hinge being on a narrow edge and the other on a broad surface. In this case also there is the alternative of putting the hinges on the outside, instead of in the joint, but the latter is the neatest and the usual way.

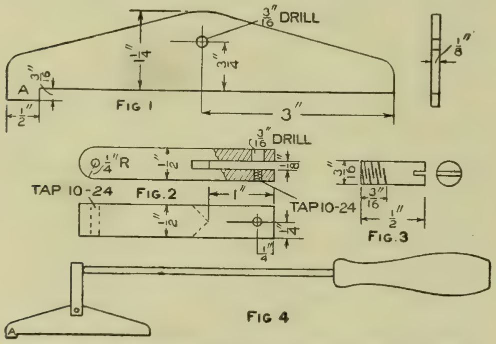
The hinges are put on the lid first, as in Fig. 13, and this is held in position, first for marking the lengths of the recesses in the box and finally for screwing on the hinges. It is better to complete the fitting of the hinges to the cover before marking their position on the body of the box, though the lines of thickness and width may be gauged on both simultaneously.

Doors are treated in the same way, the hinges being put on the door first, which is then supported in position against the post for marking the height of the hinges and finally for screwing them on. The weight of the door is supported during these operations by wedging it up with pieces of wood beneath. The door should be turned back as far as possible, so that the hinges are wide open, as in the upper views in Figs. 7 and 8. There is no difficulty in attaching it properly.

When hanging house doors, an open joint is often allowed, so that the door will open reasonably wide, without binding against the molding of the doorway. The open joint is not made by screwing the hinges on the surface, but is procured by letting their knuckles stand out a little farther when the door is closed.

Magnetic Test for Heat in Hardening Steel

When hardening steel one must know the proper point at which to quench it to obtain the best results. Workmen who do this kind of work regularly, learn to gauge the point of quenching quite accurately, but for the amateur, steel hardening presents many difficulties.



Detail of the Parts for the Construction of the Tilting Permanent Magnet

A very simple method by which anyone who wants to harden a few tools may obtain as good results as a professional mechanic, though, perhaps, it will take him a little more time, is by the use of a magnet. The temperature at which steel should be quenched to secure the maximum hardness is just above the point where the carbon in the steel changes from the free to the combined state. Curiously enough, at this same point steel becomes non-magnetic, and by taking advantage of this fact one can harden steel almost perfectly. The ordinary horseshoe magnet is not sensitive enough to show this change, but with the balanced magnet illustrated the point is clearly indicated.

Tool steel is preferable for the magnet, but any steel that will harden can be used. A piece of saw steel, or even an old file ground smooth, can be used. Anneal it and then saw and file to the shape shown in Fig. 1, and drill a 3/16-in. hole for the pivot, being careful to get the hole perpendicular to the faces. Balance the magnet on a small nail placed through the hole. If it does not balance, take some metal off from the heavier end until it hangs exactly horizontal. If possible, grind the faces parallel and finish it all over. Harden by heating it to a medium red and then quench in water. The metal should be polished, as its movements may then be seen much better in the dim light of the forge. Magnetize the steel by touching it to one of the field poles of a running motor or generator, or wind several hundred turns of fine wire around it, and pass a direct current through the coil thus formed. Only a moderate degree of magnetization is necessary.

Make the support of brass, ½ in. square. Round up one end and square the other as shown in Fig. 2. Drill holes with a $\frac{5}{32}$-in. drill and then cut the slot. Tap the holes for a machine screw and ream or drill out the hole on one side of the slot to $\frac{3}{16}$ in. Make a headless screw of $\frac{3}{16}$-in. brass rod, as shown in Fig. 3, cutting a thread on one end and slotting the other with a hacksaw. Leave it a little more than ½ in. long, so that it can be filed up flush with the hanger when in place. Assemble these three parts as shown in Fig. 4 and see that the magnet is free to swing easily through its entire arc.

A piece of $\frac{3}{16}$-in. iron rod, 18 in. long, is used for a handle. Threads are cut on one end so that it can be screwed into the upper part of the hanger. An old file handle is driven onto the other end of the rod.

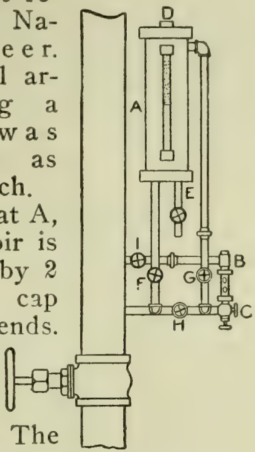
The work is heated to a dull red and the point A of the magnet, held by the handle, is applied to the heated part. If a chisel is to be hardened, it must, of course, be tested near the cutting edge where it is to be hardest. If the magnet sticks to the work, heat a little more and try again. When the work gets to a medium red, it will be found that there is no attraction for the magnet. This means that the hardening point has been reached and passed a little, so the work should immediately be plunged into brine, water or oil, according to the degree of hardness required. If the steel is chipped a little, it will be found to have a very fine grain and is therefore very hard. This method, while not speedy, will produce good results, if care is taken to watch the actions of the magnet.

¶Back pressure and overheating of an automobile engine is sometimes caused by dirty, soot-filled exhaust pipes. The cut-out gives temporary relief, but a thorough cleaning is the only permanent remedy.

How to Make a Large-Capacity Lubricator

Owing to the huge capacity of a large air compressor, the ordinary hydrostatic pint lubricator was found inadequate without refilling, says the National Engineer. Therefore, a novel arrangement having a large reservoir was made and used as shown in the sketch.

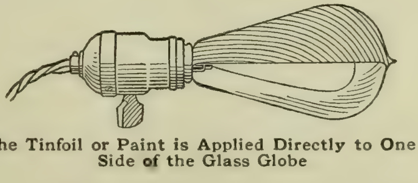
A piece of pipe, at A, for the oil reservoir is 3 in. in diameter by 2 ft. long, with a cap screwed on both ends. The parts B and C are fittings taken from the original lubricator. The filling plug is at D, and E is the valve for drawing off the water when the reservoir A is empty of oil. An emergency valve is located at I.



Glycerine and litharge paste were used successfully to make up the joints to prevent possible leaks, and after giving the outside a coat of japan varnish it presented a neat appearance. To refill, the valves F and G must be closed, but when in operation they are open, and valve H is kept closed.

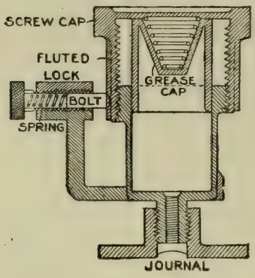
Shade for an Electric Globe

It is sometimes necessary to have a reflector or shade for an electric light, and where no reflector is at hand a very good substitute can be made by gluing tinfoil on one side of the globe as shown in the sketch. If that part of the globe which is covered with the tinfoil is painted instead, it will make a shade for the eyes when the light is used about a machine.


The Tinfoil or Paint is Applied Directly to One Side of the Glass Globe

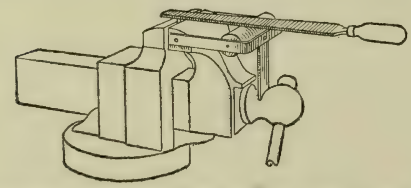
Grease Cup for Automobiles

Lubrication by means of grease depends for its efficiency upon the quality of the grease and upon the use of a well-designed grease cup. The illustration here shown, from The Automobile, is of a special form of grease cup that holds enough grease to make it worth while using a cup, and so made that, by means of a spring which presses against the supplementary cap, the grease is gently pressed down all the time. In addition to this spring, the cap proper may be screwed down from time to time, thus adding to the pressure exerted by the spring. A lock bolt is located at a convenient point, so contrived that it does not have to be withdrawn when it is desired to screw down on the cap. It affords absolute security, preventing the cap from screwing off or down. This cup, although rather complicated, will effect quite a saving in that no sand will penetrate into the bearings, if it is used.



Vise Guides for Filing Flat Surfaces

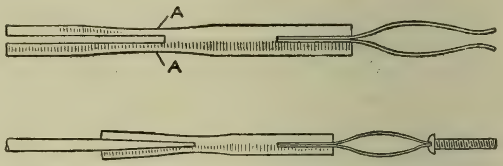
When it is desired to file a perfectly flat surface in a vise, the attachment shown in the sketch will greatly assist the filer to that end. The device is made of a strip of iron, about ¼ in. thick and 2 in. wide, and bent as shown. This is fitted with a suitable roller turned from wood and fitted with a steel axle to run freely between the arms, and the ends of the arms pivoted on pins set in the sides of the outer vise jaw. A metal standard is attached to rest on the vise screw to keep the roller in position. The manner of using the file over the roller is obvious.



Roller Attachment to Keep the Surface of the File on a Perfect Level

Attachment for a Screwdriver

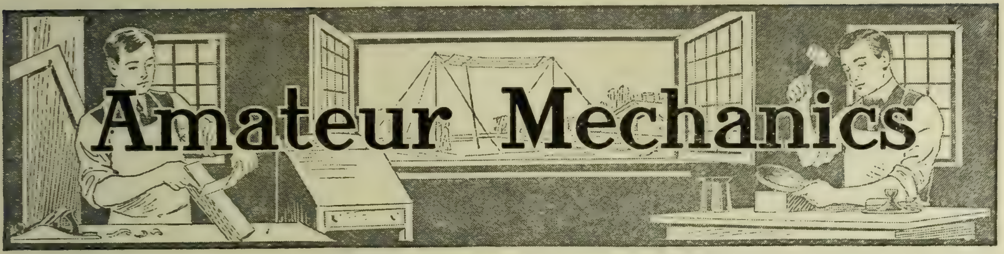
The simple device shown in the cut will be found very useful in starting screws that are hard to reach with the hand. A piece of ¼-in. round steel rod, about 3 in. in length, should be obtained. Saw a 1½-in. slot in one end of this rod and a ½-in. slot in the other. This latter should be broad enough to allow two thicknesses of an ordinary alarm-clock spring to enter. Then file the sides of the piece, as shown in the sketch at AA, which will allow them to spring apart and clamp the screwdriver bit. Take two pieces of clock spring, about 1¼ in. long, and set them in the ½-in. slot with a little solder, then bend them as shown in the upper part of the sketch. These springs, when bent together, will catch and hold an ordinary screw. The device will be sufficiently strong to drive a small machine or wood screw to the head, while for larger screws it may be used only for starting them.



The Screw-Holding Attachment Slips on the Blade of a Screwdriver for Starting a Screw

Casters on Wheelbarrow Rests

Having considerable wheeling to do on a cement sidewalk, for almost one-quarter mile, I found that the task was greatly lightened by attaching a large caster on each post or handle rest. I could set the rests down on the sidewalk and push the wheelbarrow along just as a four-wheeled cart.—Contributed by W. A. Stamaman, Berlin, Canada.



Enlarging Photographs

By A. E. SWOYER

When the photographer wishes to make an enlarged print from a small negative, he arranges a suitable light and condensers back of the negative and by means of a lens projects the resultant image upon a sheet of sensitive paper. Owing to the comparative weakness of the light, however, it is necessary either to use bromide paper or some of the faster brands of developing-out paper. If a more artistic medium is desired, a glass positive must first be made and enlarged to produce a negative from which the final prints will be made by contact. This process is somewhat clumsy and expensive, for if any retouching or doctoring is to be done, it must be upon a glass surface, either that of the two negatives or of the intermediate positive. As all of this work is done by transmitted light, there is the loss of fine detail common to all enlargements.

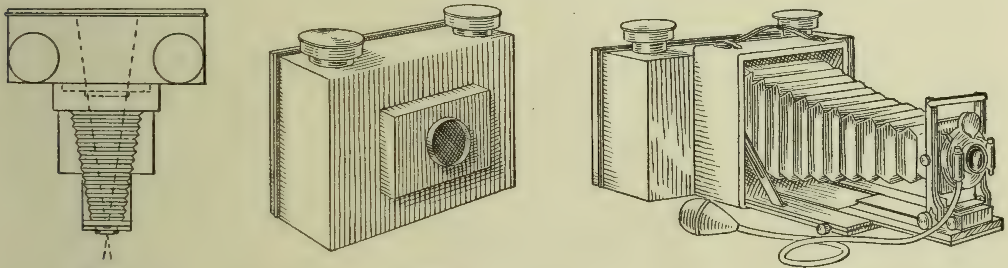


FIG. 1 FIG. 2 FIG. 3

An Ordinary Post-Card Projector Used Back of a Camera to Illuminate a Photograph Which is Enlarged on a Plate to Make a Negative Instead of a Print

The difficulties incident to this process may be done away with by the use of a modification of the popular post-card projector; the alteration consisting simply in the substitution of a better lens for the cheap plate glass with which such instruments are usually fitted.

A contact print, preferably on glossy paper, ferrotyped, is made from the original negative by contact in the usual way; this is then placed in the modified projector and the image thrown upon a sensitive plate of the desired size. After a brief exposure, development will show an enlarged negative having every quality of the original.

The advantages of this process are obvious. In the first place, the comparative cheapness of the apparatus is a factor; in the second, the intermediate glass positive is eliminated, the print which is substituted for it providing a much better medium for retouching, faking or printing in. Transparent water colors in the less actinic shades may be used upon this print to control the final result, and if spoiled, it may be replaced at a negligible cost.

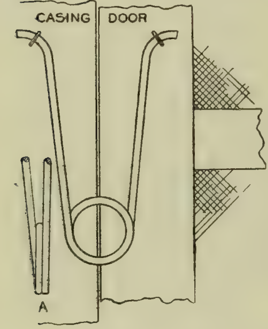
At first glance, it would appear as if

this method were simply a form of photographic copying; it is, in fact, the reverse. For in copying any object with a camera, the sensitive medium is behind the lens and the object to be copied is in front, and the size of the copy is therefore limited both by that of the camera and by its bellows draw. In the reflection process, the object to be copied is back of the lens and the sensitive medium is in front; as large a copy can be made with a small camera as with an eight by ten. It is really more convenient to work with a short-focus lens and a camera of limited bellows extension; the nearer the lens is to the back of the camera the larger will be the projected image.

The diagram (Fig. 1) shows that the size of the object to be enlarged does not depend upon the focal length of the lens used, as in ordinary enlarging, but simply upon the size of the opening in the front of the projector. The dotted lines are drawn from the edges of the card to be projected through the lens. Figure 2 is a sketch of a projector with the lens tube removed, so that it may be used with a camera as shown in Fig. 3.

Homemade Screen-Door Spring

A screen or storm-door spring can be easily made of spring-steel wire.



The wire is bent to the shape shown in the sketch and two turns given to the coil as shown at A. The ends of the wire are fastened to the casing and door with staples. Two or three of these springs can be attached to one door where it is necessary to have more strength.—Contributed by Wm. Rosenberg, Watertown, Mass.

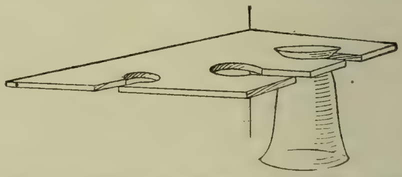
A Surprise Water Bottle

The performer produces a bottle and gives it with a glass to anyone in the audience, asking the person selected to take a drink of a very delicious concoction. When the person attempts to pour out the solution it is found to be frozen.

To perform this trick, the fluid must be previously made with a saturated solution of sulphate of soda and hot water. Fill a clean white bottle with the solution, taking care to cork the bottle while the liquid is hot. The liquid remains in a fluid state as long as the bottle is corked. When the bottle is shown, it appears to contain a liquid, and in handing it to a person the performer must be careful to take out the cork in time to allow it to solidify. In order to gain the proper time, pretend to be looking for a glass, make some remark about a sudden chill or feel the hand holding the bottle and say it is very cold. In the meantime, the air acting upon the solution has caused it to become fixed and immovable, and when the person attempts to pour it out, he finds it is impossible.

A Graduate Holder

A simple and easily constructed graduate holder in the form of a bracket placed in the corner of a dark room is shown in the sketch. The bracket not only holds the graduates securely, but allows them to drain perfectly and prevents dust settling on the inside, as they are suspended by the base. Holes of different size are cut in the board to accommodate large, medium and small graduates.



The Graduate Holder is Permanently Fastened in a Corner of the Dark Room

An Alarm for a Sleepwalker

A little girl in our family would walk in her sleep and it caused us no little worry lest she might leave the house without our knowing it. I therefore rigged up an alarm device to ring a bell should she leave the room. The device consisted of a bell and battery in a circuit, and a switch which was attached to one door casing. A string was stretched across the doorway and attached to the switch lever in such a manner as to pull it closed when the string was pushed through the doorway opening.—Contributed by J. Woodburn, Toronto, Canada.

A Kraut and Root Grinder

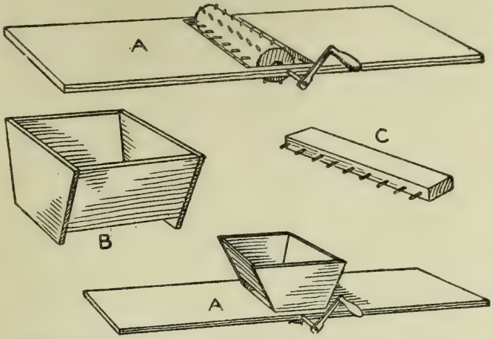
The grinder is intended mainly for chopping cabbage when making sauerkraut, but it is also of much service in grinding vegetables and roots to be cooked for poultry.

The base A is made of a plank, at least 1 ft. wide and 4 ft. long, with a 9¼ by 9½-in. hole cut in the center. The grinding part, or cylinder, is made of wood, 3 in. in diameter and 9 in. long, with 8-penny nails, spaced $\frac{3}{16}$ in. apart, driven partly into it and then cut off so as to leave ¼ in. projecting. The cylinder is turned by means of a crank attached to the end of the shaft.

A hopper, B, is constructed, 4 by 9½ in. inside measurement at the bottom, and as large as necessary at the top. A space is provided at the bottom as shown to receive the concave C, which consists of a 1-in. board, 3 to 4 in. wide and 9 in. long, with nails driven in and cut off as described for the cylinder.

The hopper is securely fastened on top of the baseboard and over the cylinder. The concave is slipped into place and held with wedges or by driving two nails in just far enough to fasten it temporarily. The concave can be adjusted for grinding the different vegetable products, or replaced at any time with a new one.

The ends of the base are supported on boxes, or legs may be provided if desired. When grinding cabbage, cut the heads into quarters and remove the hearts. Press the cabbage on the cylinder and turn the crank. Fine bits of cabbage, suitable for sauerkraut, will be the result.—Contributed by J. G. Allshouse, Avonmore, Pa.

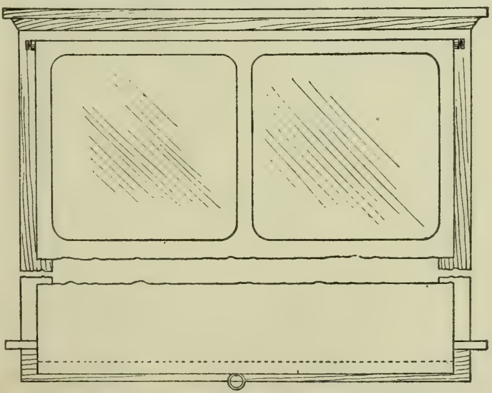


The Grinder will Easily Reduce Cabbage Heads to Bits Suitable for Sauerkraut

Opening for Air at the Top of a Shade

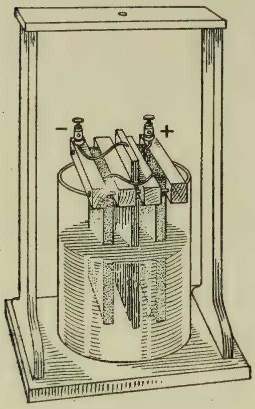
Procure an extra long shade and cut two openings in the end to be used at the top. The openings may be cut square or ornamental as desired, leaving a strip at each side and one in the center. These strips are reinforced by gluing on some of the same material as the shade or pieces of tape.

A shade made in this manner permits the air to enter the room unhindered when the top sash is lowered and at the same time obstructs the view of passers-by.—Contributed by Warren E. Crane, Cleveland, O.



When the Shade is Pulled Down the Openings Coincide with the Opening over the Upper Sash

A Homemade Wet Battery



Procure a large water bottle and have a glass cutter cut the top off so that the lower portion will form a jar about 8½ in. high. Next obtain two pieces of carbon, about 8 in. long, 4 in. wide and ¼ in. thick. Melt up some old scrap zinc and mold a piece having the same dimensions as the pieces of carbon. The mold for casting the zinc may be made by nailing some ¼-in. strips of wood on a piece of dry board, forming a shallow box, 4 in. wide and 8 in. long. Remove all the impurities from the surface of the zinc when it is melted, with a metal spoon or piece of tin. Before filling the mold with the metal, place a piece of No. 14 gauge bare copper wire through a small hole in one of the end pieces forming the mold, and allow it to project several inches inside, and make sure the mold is perfectly level. The zinc will run around the end of the wire, which is to afford a means of connecting the zinc plate to one of the binding posts forming the terminals of the cell.

Cut from some hard wood four pieces a little longer than the outside diameter of the glass jar, two of them ½ by ½ in., and two, ½ by ⅝ in. Drill a ⅛-in. hole in each end of all four pieces, the holes being perpendicular to the ½-in. dimension in each case, and about ⅜ in. from the end. Boil all the pieces for several minutes in paraffin and stand them up on end to drain. Procure two ⅛-in. brass bolts, 3½ in. long, which are to be used in clamping the elements of the cell together. The two smaller pieces of wood should be placed on each side of one end of the zinc, then the carbon pieces and the larger pieces of wood outside the carbon pieces. The carbon plates should be connected together and then connected to a binding post which forms the positive terminal of the cell. If unable to obtain pieces of carbon of the required dimensions, a number of ordinary electric-light carbons may be used. Get about ten ½-in. carbons, without the copper coating, if possible; if not, file all the copper off. Cut these carbons off, forming 8-in. lengths. File the top ends of the carbons flat and so that they all become equal in thickness, and clamp them in place by means of the brass bolts. If rods are used, they should all be connected together by means of a piece of copper wire and then to a binding post.

The plates may now be hung in the jar, the wooden pieces resting on the top of the jar and acting as a support. The solution for this cell is made by dissolving ½ lb. of potassium bichromate in ½ gal. of water, and then adding very slowly ½ lb. of strong sulphuric acid. More or less solution may be made by using the proper proportion of each ingredient.

This cell will have a voltage of two volts, a rather low internal resistance, and will be capable of delivering a large current. If it should begin to show signs of exhaustion, a little more acid may be added.

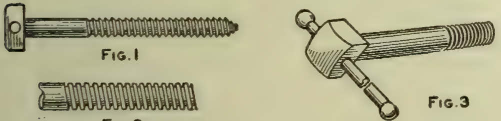
A chemical action goes on in this cell regardless of whether it supplies current to an external circuit or not, and for this reason the elements should be removed from the solution and hung directly over the jar when the cell is not in use. A simple device for this purpose may be constructed as shown. A cord may be passed through the opening in the crossbar at the top and its lower end attached to the elements. When the elements are drawn out of the solution, the upper end of the cord may be fastened in some manner. This frame can, of course, be made longer, so it will accommodate a number of cells.

Hulling Walnuts

When gathering my winter supply of walnuts, I found that they could not be hulled readily by hand. Not knowing of any machine designed for the purpose, I tried running them through a corn sheller and found it to do the work nicely. The sheller not only hulled them, but separated the nuts from the hulls, the nuts being carried out through the cob opening and the hulls dropping through the grain spout.—Contributed by Irl R. Hicks, Hallsville, Mo.

How to Make a Small Vise Screw

Procure an ordinary lag screw, as shown in Fig. 1, cut off the pointed end and file the threads into the shape shown in Fig. 2. A hole is drilled through the head and a handle put in, as shown in Fig. 3. This makes a good substitute screw when the original screw for a small vise is broken.—Contributed by James M. Kane, Doylestown, Pa.



A Vise Screw Formed of an Ordinary Lag Screw, the Threads being Made Square and a Handle Attached

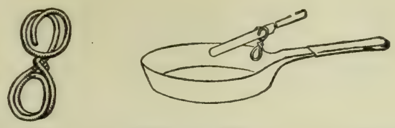
A Medicine-Spoon Holder

When a dropper is not at hand it is difficult to drop medicine in a spoon while holding it, and the shape of the spoon will not permit its being set down. A shoe horn used as shown in the sketch will hold the spoon right side up and in a position to hold the liquid.—Contributed by Maurice Baudier, New Orleans, La.

A Shoe Horn is the Right Shape to Hold the Spoon Right Side Up and Level

Knife Holder on a Frying Pan

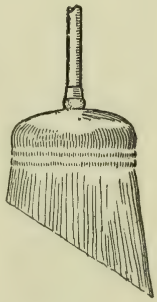
Instead of laying a knife on the stove or carrying it to a table or elsewhere while frying anything in a pan, make a clip to fit the edge of the pan for holding the knife when it is not in use. The clip is easily made of brass wire and when attached to a frying pan it will save many steps.—Contributed by John C. Harlacker, Jr., Cumberland, B. C.



The Shape of the Clip and Manner of Attaching It to a Frying Pan

A Broom for Sweeping Out Corners in Steps

Sweeping the corners of steps is one of the greatest difficulties of the housewife, or others who have a number of stairs to sweep. I have made this task easy in a very simple manner. I secured a used broom, the longer and newer the better, and cut the straws off diagonally across the sweeping edge. The pointed part will easily clean out the corners in steps or in a room.—Contributed by W. A. Stamaman, Berlin, Ontario.

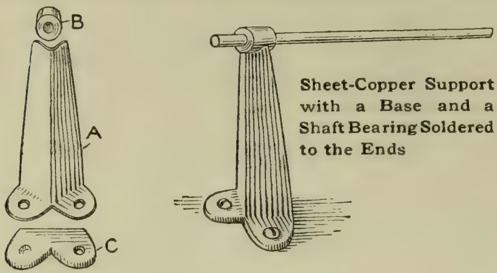


Removing a Cork from a Bottle

A cork that has been pushed into a bottle accidentally or otherwise can be easily removed in the following manner: Tie several knots in one end of a string to form a large cluster and drop it into the bottle, holding on to the other end of the string. Turn the bottle over so that the cork will fall to the opening in the neck, then pull on the string. The cluster formed by the knots at the end of the string will easily draw out the cork.—Contributed by Frank Hart, Chicago, Ill.

Bearings for Model Work

For experimental work I use hangers or bearings made of sheet brass or copper, bent at right angles for strength and capped with a box. The main part of the bearing A is shaped as shown, and the box B consists of a small piece cut from a brass rod and drilled for the size of the shaft. The box is soldered to the top end of A and the base C to the bottom end. When a large metal base is used for a certain model, the part A is attached directly to that base and the part C need not be used.

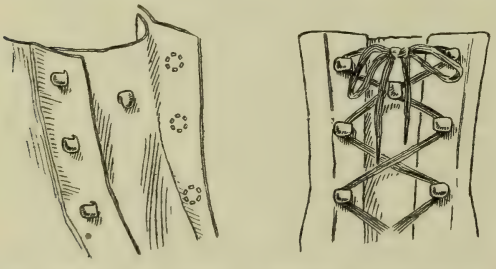


Sheet-Copper Support with a Base and a Shaft Bearing Soldered to the Ends

The bearings can be made in different heights, each of which will demand a corresponding size and thickness of the parts. Sheet brass or copper, $\frac{1}{32}$ in. thick, is about right for a bearing 3 in. high.—Contributed by W. E. Day, Pittsfield, Mass.

Holding the Tongue of a Shoe in Place

The tongue in a shoe will often slip down or over to one side or the other and expose the hose. To overcome this and have the tongue fit snugly in the right place, fasten a common lace clasp or hook near the top of the tongue, as shown in the illustration, so that in lacing the shoe the laces are passed under the hook to hold the tongue in place.

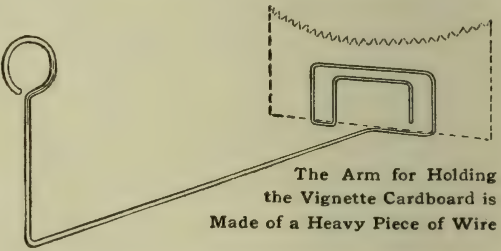


The Hook on the Tongue of the Shoe and Manner of Lacing to Hold the Tongue

A Photo Vignetter

Procure a piece of heavy wire, one that is fairly stiff, says Camera Craft, and a pair of pliers and bend the wire with the pliers as shown in the illustration. After the loop is made to fit around the lens barrel the wire is bent at right angles at a point 6 in. below the circle. At a distance of 8 in. on the extending part of the wire it is bent as shown to form a clip for holding a sheet of cardboard.

The cardboard should be about 7 in. wide and of dark color, with one edge cut semicircular and notched. The size of the wire and the other measurements will depend upon the size and focal length of the lens. If a heavy vignetting card is required, it may be necessary to make the portion that encircles the lens double in length, bending it back upon itself to secure a firmer hold. This is a cheap and efficient vignetter that anyone can make in a few moments of spare time.



The Arm for Holding the Vignette Cardboard is Made of a Heavy Piece of Wire

Pocket for the Inside of a Book Cover

Students or anyone wishing to retain notes on a subject will find it quite handy to have a large envelope pasted in the back of each textbook. Instead of having notes all through the book, they can be arranged in order and slipped into the envelope. If the book is accidentally dropped, the notes will not be lost.—Contributed by Harold Mynning, Chicago, Ill.

How to Make an Electric Furnace

A small electric furnace that will be very serviceable in a laboratory may be made as follows:

First procure a small clay flowerpot, about 4 in. in diameter at the bottom, and also a small clay crucible, about 2 in. in diameter at the bottom and at least 1 in. less in height than the flowerpot, and having as nearly as possible the same slope to its sides as the pot. Now obtain a small quantity of asbestos compound and pack it around the small crucible inside the flowerpot. Make sure the crucible is in the exact center of the flowerpot and that their tops are even with each other. Assuming that ordinary electric-light carbons are to be used, which are about ½ in. in diameter, drill two ⅝-in. holes, exactly opposite each other, through the walls of the flowerpot and asbestos compound so that they enter the crucible about ¾ in. above its bottom on the inside. A suitable lid for the furnace may be made from ¼-in. sheet asbestos and should be large enough to cover the top of the flowerpot.

The feeds and supports for the carbon electrodes are constructed as follows: Procure two pieces of ⅛-in. brass, 1 in. wide and 9 in. long. Cut a ⅛-in. groove lengthwise in the center of these pieces to within 1½ in. of each end, as shown in Fig. 1. Drill four ⅛-in. holes, AA, in each piece, a ⅜-in. hole, B, in one end and a 3/16-in. hole, C, in the other end. Now bend the ends up at right angles to the remainder of the piece along the dotted lines shown at D and E. Next obtain two ⅜-in. rods, 10 3/16 in. long. Turn one end of each down to a 3/16-in. diameter for a distance of ⅜ in. From that point thread the same end of the rods for a distance of 6 in. Drill a 1/16-in. hole in each end of the rods a little less than ¼ in. from the ends. The dimensions of the rods are given in Fig. 2. Two small rubber or wooden handles, similar to the one shown in Fig. 3, should now be made and fastened to the large ends of the rods by means of 1/16-in. steel pins. Obtain two pieces of brass of approximately the following dimensions: 1 in. by 1 in. by 3 in. Drill four holes in each of these pieces as shown in Fig. 4. The hole H should be just large enough to allow the carbon to enter, or about ½ in. in diameter. The hole G should be tapped to take a ¼-in. machine screw, the hole F should be threaded so that the threaded rods will enter, and a small binding post should be mounted on a lug fastened in the hole J. Cut away one end of this piece as shown in Fig. 4 until it is a little less than ⅛ in. in thickness, or so it will enter the grooves cut in the brass strips.

The parts of the furnace are now ready to assemble, which may be done as follows: Procure a piece of well seasoned board, hard wood if possible, about 1 in. thick, 8 in. wide and perhaps 20 in. long. Cover one side of this board and the edges with some ⅛-in. sheet asbestos. Now place the flowerpot in the exact center and then mount the grooved brass strips one on either side of it with the longest dimension parallel to the longest dimen-

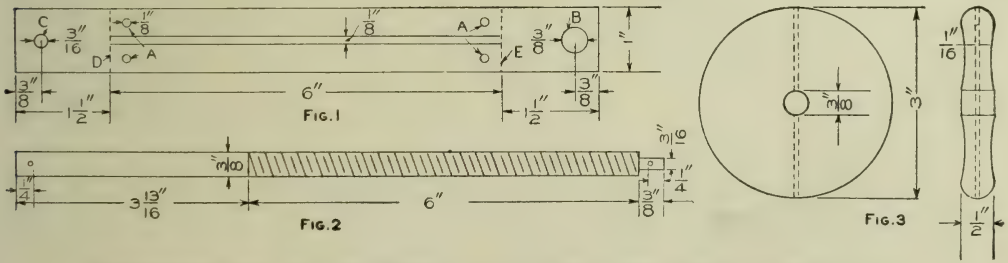


Fig. 1 Fig. 2 Fig. 3

Details of the Base, Rod and Handle for Each Carbon Feed, Which is Attached to the Large Base on One Side of the Furnace sion of the board and the inside end about 1 in. from the side of the pot. The end with the $\frac{3}{16}$-in. holes should be next to the pot. Assemble the parts of the carbon feeds and then cut out some circular disks of asbestos to place under the flowerpot so as to raise it to such a position that the holes in its sides will be on a line with the carbon rods. Three long screws should now be placed in the board, forming the base, in such a position as to hold the flowerpot always in place. This completes the furnace proper, which is shown in Fig. 5. The furnace can now be put into operation provided there is a suitable current rheostat to connect in series with the carbon arc to prevent an excessive current being taken from the line. If such a rheostat is not available, a serviceable one may be made as follows:

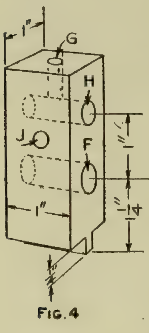


FIG. 4

Obtain two pieces of $\frac{1}{16}$-in. sheet iron, 6 by 6 in., that are to form the end plates. Cut off the corners of one piece so as to form an octagon and drill a number of ⅛-in. and ¼-in. holes in it, as shown in Fig. 6. Bend the corners of the other piece down along the dotted lines marked L, Fig. 7, and then make a second bend in each corner along the dotted lines K, so that the outermost portion of the corner is parallel to the main portion of the piece. Drill a number of ⅛-in. holes in this piece as indicated. A 3-in. opening should be cut in the center of this piece to give access to the interior of the completed rheostat. Now obtain eight ⅜-in. iron rods, 10 in. long. Drill and tap each end of these rods to accommodate a ⅛-in. machine screw. Wrap several layers of thin sheet asbestos around each rod and tie it in place with some thread. These rods should now be fastened between the end plates by means of a number of iron machine screws. Mount four back-connected binding posts on the plate shown in Fig. 6, making sure they are insulated from the plate by means of suitable bushings and washers.

Procure a small quantity of No. 14 gauge iron wire. Fasten one end of the wire under the head of the screw holding one of the binding posts in place and then wind it around the rods about 20 times, making the distance between the turns equal to the diameter of the wire. After winding on the 20 turns, attach a short piece of wire to the main wire and fasten the free end of the short piece to one of the other binding posts. Wind on 20 more turns, and make another connection to the third binding post, then complete the

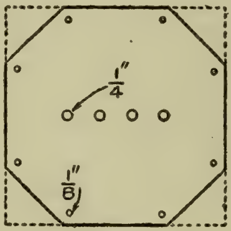


FIG. 6

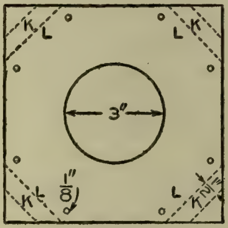


FIG. 7

Detail of the Upper and Lower End Plates That are Used in Making a Rheostat

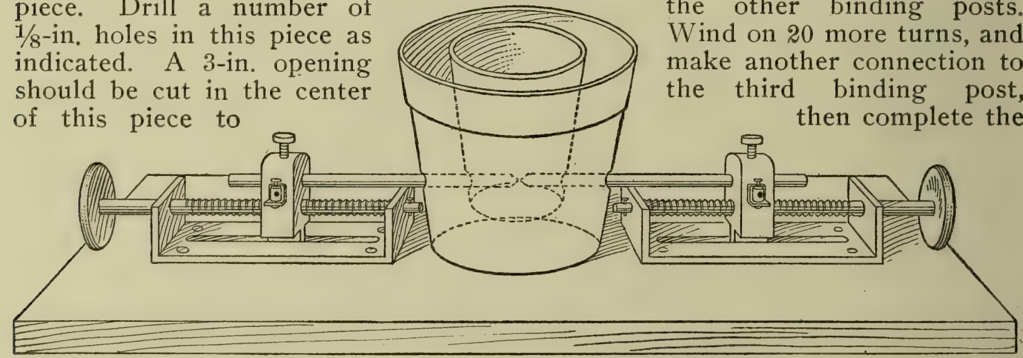


FIG. 5

The Furnace Consists of a Flowerpot in Which a Crucible is Set, and on Either Side the Carbon Holders are Fastened to the Base winding and attach the end to the remaining binding post. Different amounts of this resistance can now be connected in series with the arc by changing the connections from one binding post to another. The rheostat may be located on a bracket fastened to the wall, but care must be taken not to place it in such a position that it will come into contact with inflammable material. As an extra precaution, the circuit should be properly fused.

Cleaning Brass Articles

Embossed or undercut brass work may be easily cleaned by boiling the pieces in a strong solution of caustic soda or lye, and then immersing them in a mixture of hydrochloric acid, 6 parts; water, 2 parts, and nitric acid, 1 part, until they become covered with a dark deposit. Take them from the solution and remove the black substance with a fine scratch brush. After cleaned in this manner, rinse in hot water and dry in hot sawdust.

A fine orange-yellow tinge may be given to the brass by substituting an equivalent weight of powdered alum for the nitric acid in the solution.—Contributed by Mrs. Richard F. Pohle, E. Lynn, Mass.

A Whetting Block

A handy tool gauge for sharpening the various tools about the household is made of a block of wood with the sides of one end cut sloping in different degrees so that each will serve to secure the proper slant of the cutting edge on a certain tool.

The block of wood with the corners cut is shown in Fig. 1, and the manner of whetting a chisel is shown in Fig. 2.—Contributed by Will Parker, Wibaux, Mont.

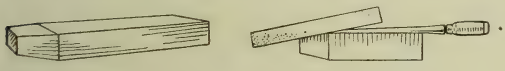


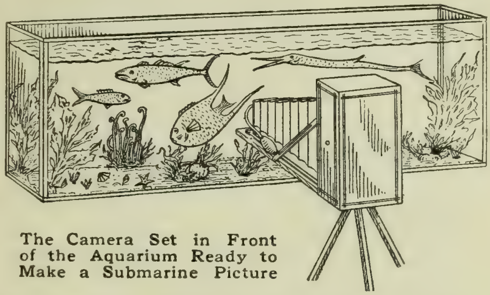
FIG 1 FIG.2

The Sloping Edges on the Block of Wood and the Manner of Whetting a Chisel

ℭA cardboard cut the same size as a page and fastened with paper clips in the center of a magazine will prevent the pages from folding over when the magazine is placed in a bookcase.

Submarine Photographs

A photographer at a seashore resort, wishing to increase his sales of souvenir postal cards, rigged up a device for producing negatives to make "submarine" pictures. The device consisted of an aquarium, about 40 in. long, 18 in. high and 6 in. wide. The aquarium was designed to stand on edge or the narrow way, and was equipped with rocks, living sea moss, kelp, and some fish, and the bottom was covered with sand and shells.


The Camera Set in Front of the Aquarium Ready to Make a Submarine Picture

A canvas was hung back of the aquarium and the camera set in front at such a distance as to make a negative of only the water and the prepared sea bottom. Very fine views that will give the appearance of being made at the bottom of the sea can be produced.

Mending Paper-Pulp Utensils

Pails, washtubs, and other receptacles made of paper pulp, when cut and worn, may be easily mended with adhesive tape. After this is applied to the place to be mended, give the mended part a coating of paint, and when the paint has dried, the surface is given another coat to match the color of the article mended. Leaks may be entirely stopped in this way at a very reasonable cost.—Contributed by Katharine D. Morse, Syracuse, N. Y.

Ruling Blank Books

A special ruling for a blank book can be drawn by using a thin piece of sheet metal or cardboard, cut as shown in Fig. 1, for a template. The pencil is drawn along one edge of the cutout so that it will make lines as shown in Fig. 2.

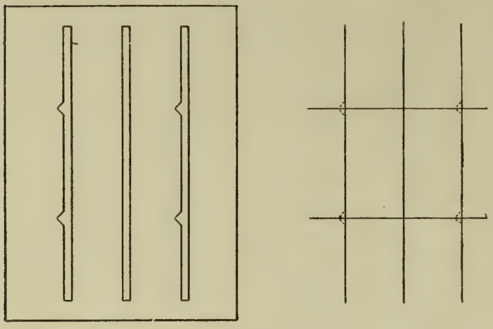


FIG. 1 FIG. 2

A Template Having Slots Cut for Drawing Special Vertical and Horizontal Lines on Pages

If horizontal lines are required, cut notches on the edge for the location of each line as shown. When the vertical lines are drawn, these notches will mark the places for the horizontal lines.

How to Demagnetize a Watch

Quite often the attendants or a visitor to an electric-light plant discovers after a few days that his watch is losing a half hour or more a day by having become magnetized by the dynamos. In stations where the old types of machines are still in use there is a great deal more danger from what is called "stray" magnetic fields than in those where modern machines are installed.

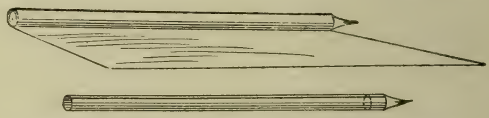
The jeweler demagnetizes a watch in the following way: He has a piece of soft iron with an opening cut in its center of such shape and size as to receive the watch, and with a fine wire wound about it. After the watch has been placed in position, an alternating current, that is, one whose direction is changing at regular intervals, is sent through the winding, and thus a magnetic field is produced that also changes in direction as the current reverses. The current is gradually reduced in value and the magnetism originally possessed by the watch is removed. When an alternating current is not available, a direct current may be used, its direction being rapidly reversed by what is known as a "polarity changer."

Anyone can demagnetize his own watch, however, with very little trouble and no expense by a much simpler method. Procure a piece of heavy linen thread about 3 ft. long, attach one end of it to the ring of the watch, hold the other end and turn the watch around until the thread is twisted at least one hundred times. Now allow the thread to unwind, and as the watch revolves, pass it back and forth near a powerful electromagnet. The field magnet of a good-sized generator or motor will answer. The machine should be in operation, or at least there should be a current in the windings about the fields, when you attempt to demagnetize the watch. While the thread is unwinding, and the watch moved in the magnetic field, gradually withdraw from the magnet so that when the clock ceases to revolve, it is just outside of the field.

Always be sure to keep the watch revolving while it is in the magnetic field, otherwise the results will be very unsatisfactory, and more harm than good may result.

A Pencil Holder

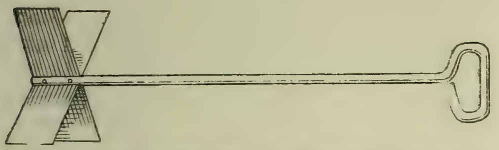
Procure a piece of paper, 7 in. long and 4 in. wide, and roll it one time around a lead pencil, then coat the remaining surface of the paper with glue. Roll this around the pencil and a tube is formed, which will hold a pencil or even pieces of pencil down to ½ in. in length.—Contributed by W. D. Brooks, Paterson, N. J.



A Stub of a Pencil can be Easily Held in the Tube for Writing

A Poultry-Food Chopper

The illustration shows a handy device for cutting roots for food, and for chopping and mixing stale bread, potatoes, peelings, refuse fruit, etc., for poultry. Any blacksmith can make the chopper at little cost. For the cutting blades use two pieces of steel a little heavier than oil-barrel hoops, each 1½ in. wide and 8 in. long. Procure a ½-in. iron rod, about 3 ft. long, bend one end in the shape of a spade handle and split the other end for a distance of about 2½ in.

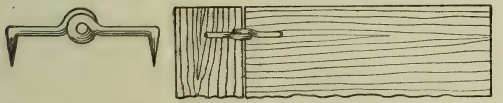

The Chopper Consists of a Rod Handle to Which Blades are Attached by Riveting or Welding

Sharpen one edge of each blade and curve the metal slightly. Lay the two blades together with the convex sides touching in the center and insert them in the slit in the handle end. They are riveted or welded in place. Heat and bend the blades at right angles.

Many of the materials mentioned for poultry foods may be chopped in an ordinary pail having a strong bottom, but it is best to make a box, about 1½ ft. square and with a plank bottom, for use with the chopper.

A Small Spring Hinge

Box covers or small doors that are seldom used can be supplied with a small spring hinge as shown in the illustration. The hinge is made of a piece of spring wire which is formed similar to a staple with a coil or complete turn given to the wire in the center. It is attached by driving the points, one into the door and the other into the casing.


The Shape of the Hinge, and the Manner of Attaching It to a Cover or Door

Shoestring End

When the tips slip from shoelaces, new ones may be readily made of fine wire. The wire is run through the end of the lace, Fig. 1, and the two ends are twisted tightly together as shown in Fig. 2. This covers the end of the lace and makes a tip that is easily passed through the eyelets.

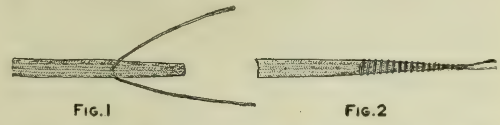
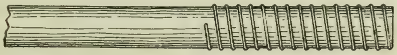


FIG. 1 FIG. 2

The Wire Prevents the Lace from Raveling and Makes a Tip for Easily Entering the Eyelets

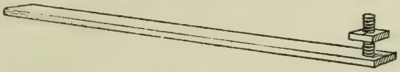
Threads on Wood Shafts

In model making it is quite necessary at times to have threads on a wood shaft. These can be made quite satisfactorily by coiling a wire around the shaft where the threads are wanted, and driving the ends into the wood.


The Wire Forms a Thread That in Many Instances is Quite Serviceable for Model Making

A Glass Breaker

After cutting glass, and especially where a small strip is to be removed, the part must be broken away in small pieces. The accompanying sketch shows a very useful tool for this purpose. The tool is made of a piece of metal having a bolt fastened to it at one end whose nut can be adjusted to the thickness of the glass.


The Nut is Set to the Thickness of the Glass and Used to Break Pieces Away

ℭOld discarded blueprints can be made white and used for sketching by dipping them in a solution of soda and water, in the proportions of 4 oz. of soda to each gallon of water.

Wood Postal Cards

The card consists of three pieces, or three-ply, veneer. The grain of the outside veneer runs lengthwise, while that of the inside piece runs crosswise. This makes the card straight and keeps it from breaking. For the inner section, walnut, which may be had as thin as 1/64 in., or any thin straight-grained veneer may be used. Two pieces of veneer, about 3¾ in. wide and 6 in. long; one piece, 6 in. wide and 3¾ in. long,—the length being with the grain of the wood—and two blocks of wood, known as cauls, of the same size or a little larger, and about ⅞ in. thick, are required.

The veneer is laid flat on a board and cut with a sharp knife or fine saw along the edge of a ruler. The three pieces are glued together in the following manner. Use ordinary hot glue, not too thin, but thin enough to run freely from the brush. The glue is applied evenly on both sides of the inner piece only, and this is then stood on edge until the glue chills. Then the cauls are heated. This is best done on a stove, or on stove lids over a gas fire. While the blocks are being heated, put one veneer on either side of the middle piece, and a piece of thin paper on each side to keep the glue from the cauls. A hand screw or vise should be opened to almost the distance required. One of the cauls is now laid flat, the veneers upon it and the other caul on top. This should be done quickly. Then clamp the whole firmly together. While the full pressure is only needed for about two hours, the pieces should be allowed to dry between the cauls for, say, a day or two, so that they will keep straight. The size of the finished card is 3⅜ in. by 5½ in. It is cut and planed to size while lying flat on a board, the plane being pushed along on its side on the bench top. To dress or clean, clamp one side to the bench. While a scraper blade may be used to advantage, it is not essential, as a block of wood and sandpaper will do. The thinner it is dressed the better. The sharp edges should be removed with sandpaper. The writing on a wood card is not done in the ordinary manner, as the ink would run. The surface must be prepared, which also gives a finish to the wood. Melt some wax or paraffin in a suitable vessel and cover the surface of the wood, using a brush or rag. The lines for the address on one side are then drawn, and the writing is done with a hard lead pencil. When through writing on one side, cover it with some strong aniline stain. (Aniline, dissolved in hot water, commonly known as water stain and used especially to stain mahogany, is the right kind.) Do not remove the wax that was raised by the pencil point. Brush the stain over until the whole side is covered. When dry, repeat on the other side. In about an hour the wax may be scraped off with a dull scraper or some other dull instrument. After every particle of wax has been removed, the card is given a good rubbing with a clean, soft rag. It is well to protect the hands as well as the table during the process.—Contributed by Chas. Schapmeier, Baltimore, Md.

Fastening Screws in Tile and Brick Walls

A simple way to fasten screws in tile or brick walls is to drill holes, not too large, for the screws, then tear up some paper, wet it and make a pulp. Pack this pulp tightly in the hole and turn in the screws. The screws will stand a great deal of strain.—Contributed by John Thomas, Brantford, Ont.

Shoe Pull Made of an Eyelet

The pulling-on strap at the back of a shoe often comes loose, or pulls out, and even if it does not, the trousers will sometimes catch on it if the strap is not tucked inside of the shoe. A very simple way to overcome these troubles is to remove the straps and substitute eyelets. A buttonhook will then serve admirably in pulling the shoe onto the foot.

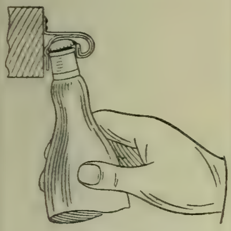


FIG. 1

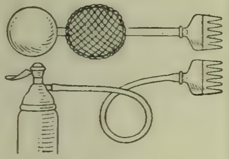


FIG. 2

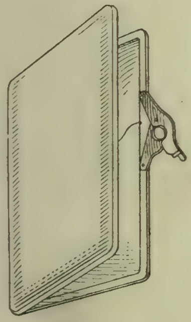


FIG. 3

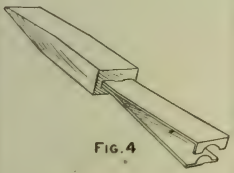


FIG. 4

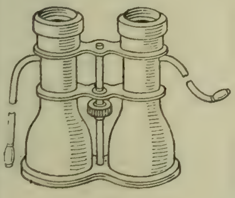


FIG. 5

PATENTS, PRACTICAL OR UNIQUE

BOTTLE OPENER—A simple and handy device for removing bottle caps is shown in Fig. 1. Attached by screws to the side of a table or cabinet, or to the woodwork of a kitchen or pantry, all that is necessary is to insert the head of the bottle under it and pull the bottle outward. This action lifts the cap off in the same manner as the ordinary hand cap remover, but as neither hand has to be placed near the head of the bottle there is no danger of injury through a slip of the opener or the breaking of glass.

LIQUID-SPRAYING COMB—Figure 2 shows a hair comb invented by a German and recently patented in Germany and England. It is a hollow comb adapted to spray liquid through the teeth while the comb is being drawn over the scalp. It may be combined either with a bulb and bellows, or with a siphon, as the means for providing the necessary pressure.

COMBINED CIGAR CASE AND CIGAR CUTTER—In Fig. 3 a cigar cutter is adapted as a fastener for a cigar case. It may be used in the same way in connection with a match box. In the cigar-case combination, the cutter is mounted on a support on the case, which support may also have hinged to it an ash tray.

COMBINATION ERASER AND PEN EXTRACTOR—The combination eraser and pen extractor shown in Fig. 4 comprises an elastic erasing body having sockets into which are inserted the corrugated tines of a pen extractor, formed with two spring jaws soldered together and provided with inturned ends for gripping the pen.

COMBINED OPERA GLASSES AND SOUND INTENSIFIER (British patent)—An ingenious combination is shown in Fig. 5, consisting of a sound-intensifying appliance attached to a pair of opera glasses. The ends of the objective tubes of the opera glasses are provided with apertures for receiving sound waves. Ear tubes are connected to the ocular tubes of the glasses by nipples, the central bridge of the glasses being provided with recesses to receive the nipples when the glasses are compressed.

COMBINED SHIRT AND PANTALOONS (British patent)—A shirt combined with pantaloons is shown in Fig. 6. The arrangement is novel, and one that may be found practical for dress shirts. It would, at least, prevent the stiffly starched front of such shirts from climbing out above the low-cut opening of the waistcoat.

GRASS CLIPPER—Figure 7 illustrates an ingenious device for the trimming of lawn borders. It comprises a cutter bar the operation of which is similar to that of a regular grain or hay-harvesting machine. The cutter bar is operated from the handle by opening and closing first one hand and then the other over the handle and the little lever extending out from each side under the handle, so as to give the cam a reciprocating angular motion which is transmitted in the ordinary way to the sliding cutter.

ILLUMINATED BUTTONS—Figure 8 illustrates a set of illuminated buttons, consisting of three miniature electric-light bulbs attached to a flexible wire connecting with a breast-pocket battery. The pressing of the switch button, attached to a second flexible-wire connection and adapted to be carried in another pocket, causes the buttons to light or go out.

NURSING-BOTTLE HOLDER FOR BABY CARRIAGES—An adjustable holder for the baby's milk bottle, particularly designed for perambulators, is shown in Fig. 9.

POTATO PLANTER (British patent) — A potato-planting apparatus adapted to be detachably connected to a plow is illustrated by Fig. 10. The endless chain running around the V-shaped frame, picks up the potatoes from the carrying receptacle, carries them over the frame and down in front of the plow share where they are discharged one by one. In a modification of this machine, the potatoes are delivered behind the plow share.

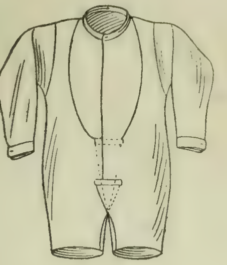


FIG. 6

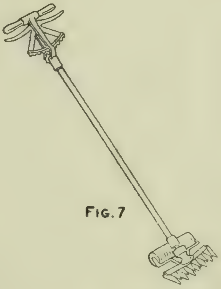


FIG. 7

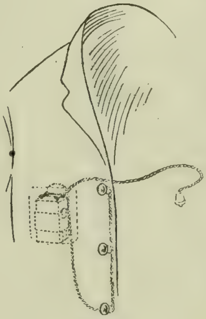


FIG. 8

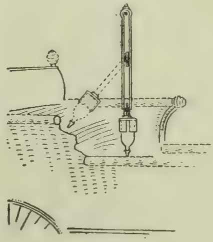


FIG. 9

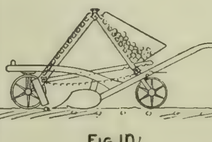


FIG. 10

THE man in the upper berth leaned over its edge, and, jamming his frown firmly down on his brow, cried in a harsh, coarse voice that was audible above the rattle and rumble of the engine:

"Hi, you, down there. Are you rich?"

"Hey?" ejaculated the man in the lower berth, almost swallowing his Adam's apple. "Whazzer mazzer?"

"I say, are you rich?"

"What's that, sir! Rich? What do you mean by waking me up in the middle of the night to ask me such a question as that?"

"I want to know—that's why."

"Well, then, confound you, I am rich. Now I hope your curiosity is satisfied and you will let me go to sleep."

"Very rich?"

"Millionaire, confound you. Now shut up, and——
——"

"Well, then, why in torment don't you charter a whole train to do your snoring in?"—Searchlight.

◆ ◆ ◆

There was a young fellow named Fred,
In an aeroplane flew overhead;
His barograph showed
He had been where it snowed,
But his epitaph shows that he's dead.
—Detroit Free Press.

◆ ◆ ◆

Jones had just run over to see if Mr. and Mrs. Blank would go to the theater with them. Mrs. Blank was sorry, but, unfortunately, Blank was out. Probably he was at the club. She would telephone. The following conversation ensued: "Halloa! Is this the ——— Club? Is my husband there? Halloa! Not there? Sure? Well, all right, then; but hold on. How do you know? I haven't even told my name." "There ain't nobody's husband here—never," was the wise attendant's reply.—Telephony.

◆ ◆ ◆

First Autoist—I feel that I have lived in vain.

Second Autoist—How so?

First Autoist—I have never gratified the ambition of my life—to run over a traffic policeman.—Satire.

◆ ◆ ◆

"So you want a position in my firm?" said the merchant to the applicant. "Well, what were you in your last job?"

"A doer, sir," answered the sad-eyed applicant.

"What's that?" asked the employer.

"Well, sir," said the sad-eyed one, "I was the doer, and the rest were the tellers. When my guv'nor wanted a thing done he would tell the cashier, the cashier would tell it to the bookkeeper, and the bookkeeper would tell it to his assistant, his assistant would tell it to the chief clerk, and the chief clerk would tell it to me."

"And what would happen then?"

"Well, sir," replied the sad-eyed applicant, "as I hadn't got any one to mention it to, I'd go and do it."—The New York Sun.

◆ ◆ ◆

"This medicine isn't having much effect, Doc."

"I saw the druggist about the prescription."

"Ah, he is doubtless to blame!"

"No, he isn't altogether to blame. It seems you handed him a laundry check."—Kansas City Journal.

◆ ◆ ◆

The station master on the Eastern Indian Railway had been given strict orders not to do anything out of the ordinary without authority from the superintendent. This accounts for his sending the following telegram:

"Superintendent's Office, Calcutta.

Tiger on platform eating conductor. Please wire instructions."—London Daily Mail.

◆ ◆ ◆

There was a delay at a moving picture show in Platteville. The people present grew restless. It was up to the manager to explain.

He came out and said: "Ladies and Gents: The derned machine's busted again! I thank you."—Philadelphia Saturday Evening Post.

Greene '15—"Why do you study Latin when it's a dead language?"

Beane '13—"Why do you study English when it's been murdered so often?"—The Dartmouth Jack-o-Lantern.

◆ ◆ ◆

Two girls on the Cicero field wanted some ice cream. Now, there was no ice cream on the field at the time. However—

"Ice cream, Mademoiselles?" quoth Aviator Max Lillie, "it already is done. Be not downcast. Ho! varlet, turn 'er around." "Er," was his biplane.

With Drew in the seat they set sail into the east. They came down in the open space in front of St. Anthony de Padua hospital in Garfield park, where there was a refectory. Also ice cream.

Later Drew held carefully strange packages in his hands, a red cherry on top of each. Motors buzzed. Propellers whirred. The machine arose, then settled at the feet of the damsels in distress.

"Your ice cream, Mademoiselles," announced Cavalier Lillie, with deep bow, taking the succulent dainties from the faithful Drew.

"My bird of the air is to serve, and whom, if not the fair? There could have been brought a freezerful, but it was not deemed necessary."

The blushing maids ate in contentment.

Then Drew told of it.—Aero and Hydro.

◆ ◆ ◆

"On the one hand," said the teacher, pointing a long finger to the map on the classroom wall, "we have the far-stretching country of Russia. On the other hand—what do we see on the other hand—Tommy?"

"Warts!" hazarded Tommy, hopeless with fright.—Tit-Bits.

◆ ◆ ◆

Two men were hotly discussing the merits of a book. Finally one of them, himself an author, said to the other:

"No, John, you can't appreciate it. You never wrote a book yourself." "No," retorted John, "and I never laid an egg, but I'm a better judge of an omelet than any hen in the state."—Publisher and Retailer.

◆ ◆ ◆

Husband—My wife explored my pockets last night.

Friend—What did she get?

Husband—Oh, what an explorer usually gets—enough material for a lecture.—Chicago Day Book.

◆ ◆ ◆

"I breathe my vows from a surcharged heart," murmured the young man.

"Nonsense, Henry," said the college damsel. "You don't breathe from your heart; you breathe from your diaphragm."—Washington Herald.

◆ ◆ ◆

A precocious child who had been attending one of the public kindergartens fell from a ladder. Her mother caught her up from the ground in terror, exclaiming:

"Oh, darling! How did you fall?"

"Vertically," replied the child without a second's hesitation.—Satire.

◆ ◆ ◆

"With all your wealth are you not afraid of the proletariat?" asked the delver in sociological problems.

"No, I ain't," snapped Mrs. Newrich. "We boil all our drinkin' water."—Railroad Men.

◆ ◆ ◆

"I saw Pibble standing on a corner yesterday winding up his estate."

"His estate?"

"Yes, a dollar watch."—The Harvester World.

◆ ◆ ◆

Baker—I was out in Blakesley's motor last week. He has everything in it, even a pedometer.

Barker—You mean a speedometer, old man. A pedometer is an instrument for measuring how far you walk.

Baker—All right. I'll stick to pedometer.—Harper's Bazaar.

November This Issue 330,000 15 Cents

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Popular Mechanics Magazine

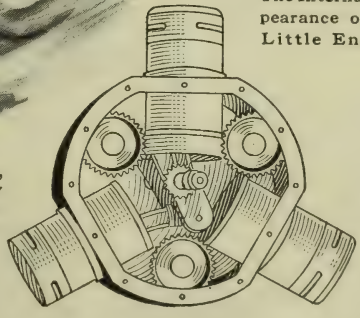
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 18 NOVEMBER, 1912 No. 5

Light Rotary Engine for Motorcycles

A ROTARY, three-cylinder, sleeve-valve motorcycle engine, weighing but 10 lb., yet developing 6 hp., is creating much interest in England. The ingenious little engine, which has already undergone successful road tests, has a bore and stroke of only 2 in. and 2¼ in., respectively. The three cylinders are placed radially at 120 deg., and revolve in opposite direction to that of the crankshaft, thus eliminating any gyroscopic effect. The transmission is by two gear wheels turning in opposite directions, one with the motor casing, and the other with the crankshaft. Each gear wheel drives a shaft connecting through bevel gears with the hub of the rear wheel of the motorcycle. The little motor is placed on the lower part of the motorcycle frame, where it has

The Little 10-Lb., 6-Hp. Rotary Engine in Position on a 90-Lb. Motorcycle



The Internal Appearance of the Little Engine the appearance of a drum. It occupies but little space, which can be seen by comparing it with that of the magneto behind, which is of a standard small type.

The motorcycle on which the engine was first tested weighs but 90 lb., or 100 lb. with the engine. In a test run of 1,000 miles, a speed of over 50 miles an hour was attained.

MONORAIL LINES PLANNED FOR ALASKA

A railroad builder in Alaska intends to extend transportation facilities to regions of the far north hitherto inaccessible to ordinary railroads by utilizing the monorail system and the gyroscopic car. Little has been done, since the discovery that a car on a single track could maintain stability through gyroscopic force, to utilize the discovery for practical work. Gyroscopic cars have been built and run, but largely as curiosities. The inventor of the monorail gyroscope car has covered the world with his patents, and one or two roads have been built to operate the system, largely however for the benefit of amusement enterprises. Now a practical railroad builder of Alaska has taken up the matter and after obtaining rights from the inventor, has about completed plans for the construction of roads through the north. The building of equipment will be started shortly in Seattle.

The idea is to utilize the system for short hauls of 10 or 15 miles where the canyons and steep grades forbid the construction of regular steam roads. A gasoline-driven car will be used on these roads. No attempt will be made to run trains, as it is the belief of the engineers who have investigated the system that better results are obtained by the use of single cars. It is probable that prior to the construction of the roads in Alaska tests will be made on experimental roads to be constructed at San Francisco for use during the Panama-Pacific Exposition and in Redmond County, Washington, where a community of farmers have become interested in the system and are contemplating the building of a 20-mile interurban road to connect their section with the Seattle markets.

REPRODUCING THE RASP OF ANCIENT LOCKS

The trouble to which an enthusiast about things ancient will go to carry out an idea is exemplified in the demand made some time ago upon a lock-making concern. An old-time lock, with both case and key large, was ordered by the owner of a suburban home built in the colonial style. This requirement was met by casting a large case which included within it a small modern lock, but the buyer also demanded that it produce the harsh, rasping noise of an ancient lock. This was finally accomplished by attaching a file to the upper part of the bolt.

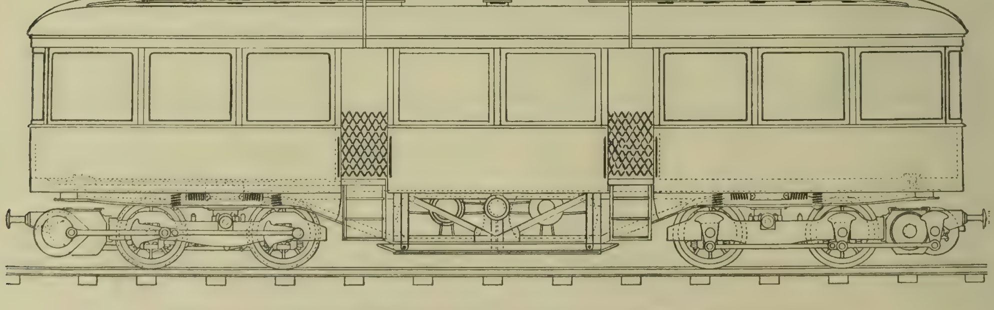


Diagram of Monorail Passenger Car of the Type Suggested for Alaska

SHOOTING RAPIDS AND FALLS IN A CANOE

Shooting the Falls of the Upper Wissahickon Creek in a Frail Canoe

No one thought J. W. Ingham, a young canoeist of the Benham Boat Club, Philadelphia, was serious when he offered to try to shoot the falls and rapids of the upper Wissahickon Creek in his canoe on a certain day. Hundreds of people gathered on the day, however, and he made the attempt, and successfully. Skillfully guiding his canoe around rocks and jagged places in the river, Ingham reached the crest of the falls, paddled hard to keep his little craft straight in the current, then shot over the falls and landed right-side-up in the seething water 25 ft. below. He kept his seat, guided the canoe to the shore and was received with a cheer which brought the police to the scene on the run. An attempt to make the trip a second time was stopped by the officials.

IMPROVING THE SOIL BY HEATING

Two English investigators have just made a study of a method of improving the quality of the soil used by farmers for raising vegetables for transplanting, especially when the soil is used in cold-frames, or in borders, and is not manured.

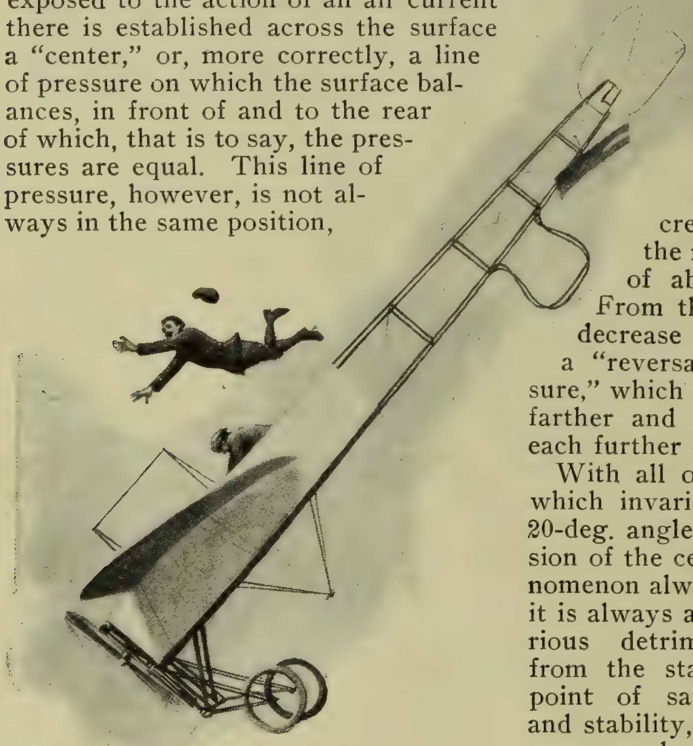
The method consists in heating the soil with steam for some time. This kills the insect pests, and seems to increase the food value of the soil. On the other hand, the seeds seem to germinate more slowly, and the early growth of the plant is somewhat retarded. This is more than made up for later, however, for the plant blossoms earlier, gives more and better fruit, and the root development is much more extensive. Badly poisoned soils might be made available by this means.

BIRD-SHAPED WINGS DISCOVERED TO POSSESS

A remarkable and apparently epoch-making discovery in aero-dynamics has been recently made by Elisha F. Fales, in the course of a series of experiments with aeroplane and bird-wing forms at the Massachusetts Institute of Technology.

The particular experiments referred to had for their object an investigation of the shifting of the center of pressure due to changes in the angle of incidence, with different wing surfaces.

It is well known, as the result of the work of many investigators, that when an ordinary flat or curved surface is exposed to the action of an air current there is established across the surface a "center," or, more correctly, a line of pressure on which the surface balances, in front of and to the rear of which, that is to say, the pressures are equal. This line of pressure, however, is not always in the same position, even with a given surface, but is bound to shift backward and forward with every change in angle.

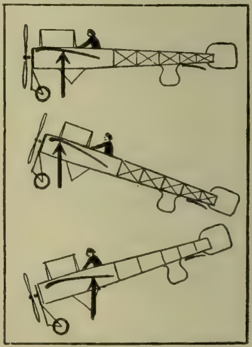


When an Aeroplane with Ordinary Wings Starts to Glide Down, the Center of Pressure Jumps Back and Tends to Make It Tilt Still More, This Being Given as a Possible Explanation of the Quimby Accident

The manner of the shifting is with most surfaces of a rather remarkable character. Commencing, for example, with a symmetrical surface placed vertically, the center of pressure is across the center line of the surface. But if the surface be inclined, the center of pressure progressively advances closer and closer to the front edge as the angle decreases, until—and this is the remarkable fact—an angle of about 20 deg. is reached. From this point on, with further decrease in the angle, there comes a "reversal of the center of pressure," which now commences to recede farther and farther to the rear with each further decrease in angle.

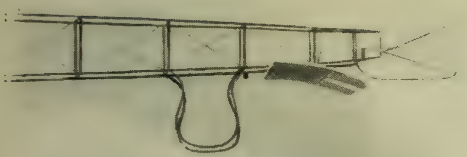
With all ordinary aeroplane wings, which invariably are set at less than 20-deg. angles of incidence, this recession of the center of pressure is a phenomenon always in evidence. But that it is always a serious detriment from the standpoint of safety and stability, becomes obvious only upon consideration of a few simple facts that concern the longitudinal balance of an aeroplane.

For instance, referring to the conventionally designed, present-day mono-



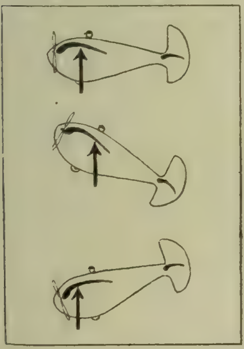
The Center of Pressure or Balance in a Monoplane with Ordinary Wings is Indicated by the Arrow, Shifting as the Monoplane Tilts Up or Down, the Tendency to Increase the Tilt Being Evident

POWER TO KEEP PLANES FROM UPSETTING



In the Case of an Aeroplane with Ordinary Wings, in Level Flight, the Center of Pressure, or Balancing Point, is near the Center of the Wings or Planes

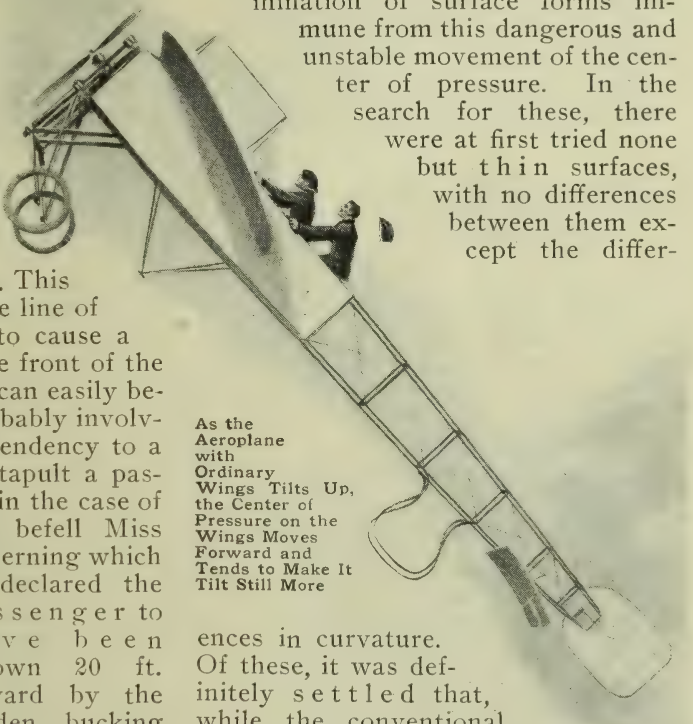
plane, illustrated in the upper picture, the weight of this machine is normally balanced near the center of the wings. But at the moment of changing from a level to a descending course, the line of pressure, because of the change in the angle of incidence, shifts backward. This rearward movement of the line of support of course tends to cause a further down-tilting of the front of the machine, to a degree that can easily become dangerous, quite probably involving a sufficiently abrupt tendency to a forward somersault to catapult a passenger out of his seat, as in the case of the recent fatality that befell Miss Quimby's Blériot and concerning which numerous eyewitnesses declared the passenger to have been thrown 20 ft. upward by the sudden bucking of the machine, as illustrated in the picture at the left.



In an Aeroplane with Wings Thick at the Front Edge and Curved, Like a Bird's, the Center of Pressure or Balance Shifts According to a Different Law, and Tends to Keep the Aeroplane Level

In the converse case, when the change is from a level to an ascending course, as in the picture on the right, the shift of the center of pressure is forward, with the result that the tendency to climb is further accentuated by the reduced support of the rear of the machine, causing the machine ultimately, in an extreme case, to lose all its forward momentum, slide tailward, and, quite probably, pass altogether out of control.

The several possible conditions described are perhaps more lucidly shown by their diagrammatic representation in the small picture on the left-hand page.



As the Aeroplane with Ordinary Wings Tilts Up, the Center of Pressure on the Wings Moves Forward and Tends to Make It Tilt Still More

Mr. Fales' investigations had for their secondary object the determination of surface forms immune from this dangerous and unstable movement of the center of pressure. In the search for these, there were at first tried none but thin surfaces, with no differences between them except the differences in curvature. Of these, it was definitely settled that, while the conventional curved surfaces are all dangerously unstable, flat surfaces, surfaces with their convex sides down, and surfaces with upcurved rear edges—like that of the Nieuport wing—are free, or nearly free, from the reversal of the center of pressure. But since the flat and convex surfaces have only a most negligible lifting capacity, while the stability of the recurved surface was found to be due to a down pressure on top of the rear wing part that largely neutralizes the sustention beneath, all of these were dismissed as far from ideal.

No further progress was made until some copies of birds' wings were made, thick at the front edge and considerably curved, with the immediate result that these were found to be inherently stable—that is to say, with every decrease in the angle of incidence the line of pressure moved forward and with each increase it moved backward, throughout the whole range of angles ever used in flight. As shown in the small diagram, on the preceding page, the movement thus acts to preserve balance instead of to upset it.

Thus is revealed to the flight engineer one more of the secrets of flight—the real, fundamental secret of longitudinal stability, which in the birds enables the use of a complete construction far shorter than man has yet dared attempt in his aeroplanes, in the best of which there is always necessary the leverage of a long tail to counteract what now is shown to be a constant tendency to overturn endwise.

In addition to this newly discovered means of securing inherent longitudinal stability by the use of exceedingly thick, deep-curved wings of the bird type, there is not to be forgotten the fact that besides making for stability, wings of this type seem also to make for efficiency, as has been indicated by the publication in recent issues of Popular Mechanics of Victor Lougheed's researches into the phenomena of streamline and reaction forms.

WARNING SIGNAL FOR GARAGE ENTRANCES

Just outside the entrance of a garage in Kansas City is placed an exceptionally practical and praiseworthy danger signal designed to warn passing pedestrians that a car is about to leave the garage. The signal is connected with a trap inside the garage. A car leaving the garage crosses the trap and thus clangs the alarm bell.

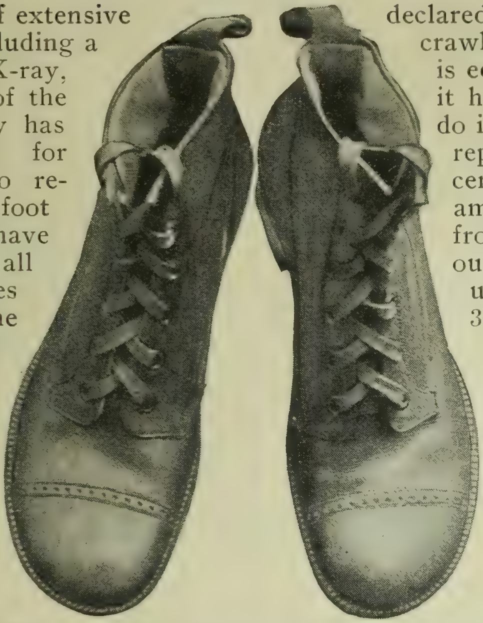
A Praiseworthy Garage Alarm for the Protection of Passing Pedestrians

ELECTRIC IRON ATTACHED TO FIRE ENGINE

An electric flatiron as first aid to a fire department, to keep water going into fire engines from cooling, while the engines are in the houses before going into service and while waiting for calls, has made its appearance in Colorado. The chief engineer of this particular fire department had considerable trouble with the steam pipes, customarily used to keep the water heated, causing the wood in the wheels of the carriage to warp. The steam radiator coils were done away with altogether for this reason, but this resulted in considerable loss of time in getting up steam with cold water when a fire occurred. The suggestion was made to the fireman to use an electric iron. The iron was clamped to the side of the old radiator pipe, and it was found that it served the purpose without doing any of the damage the steam coils had caused.

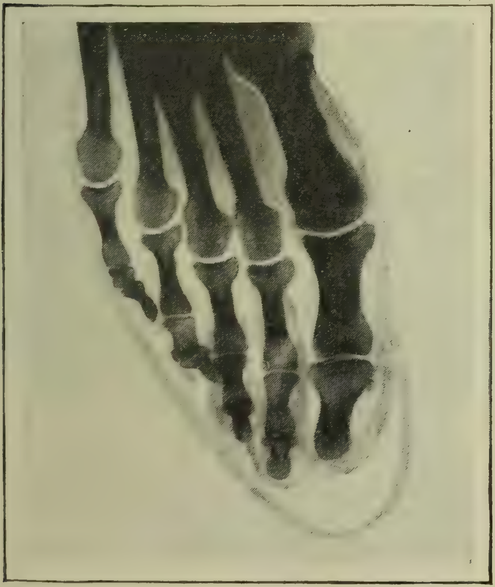
MODEL SHOE DESIGNED FOR AMERICAN ARMY

After four years of extensive experimentation, including a liberal use of the X-ray, a board of officers of the United States Army has developed a shoe for soldiers intended to remove the sources of foot troubles which have been the bane of all armies since shoes have been worn. The report of the board has been accepted by Secretary of War Stimson, and the model shoe adopted. As soon as the supply of old-style shoes now on hand is exhausted, the new shoe will come into universal use among all United States military forces. The importance of comfortable shoes to an army can not be overestimated. Napoleon declared that "an army crawls on its belly," but it is equally axiomatic that it has to use its legs to do it. It has been found repeatedly that the percentage of disability among foot soldiers from troubles growing out of improper shoes usually amounts to 30 after a strenuous march.

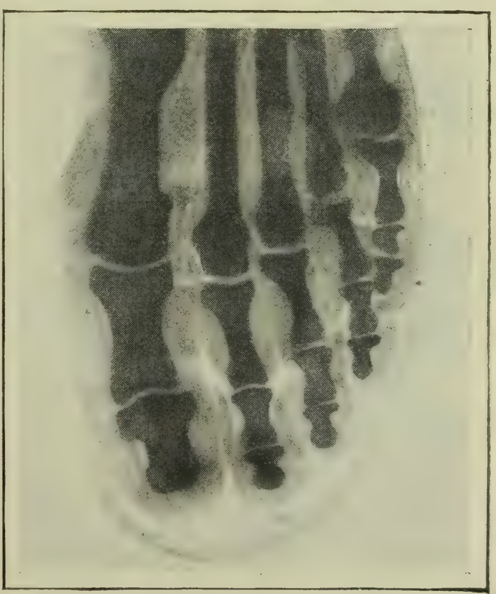


New Army Shoes, Showing Broad, Rounded Toe, Allowing Expansion Room, and Lacing and Instep Constructed to Prevent Slipping of Foot

The Army Board went at the problem with a thoroughness never before practiced in any country by the military authorities. By the use of the X-ray it was soon discovered that the army shoes in use did not truly follow the anatomical lines of the average foot. Comparison between X-ray



Röntgen-Ray Photograph of Foot in Common Type of Shoe, Showing Displacement of Bones of Toes



Soldier's Foot in New Army Shoe, as Shown by Röntgen Ray photographs of the position of the bones in the naked foot of a soldier standing with his 40-lb. marching equipment on his back, and those of the bones in the foot of the same soldier incased in the regular army shoe, disclosed the fact that the shoe was causing great displacement of the bones of the foot. Examination of the feet of thousands of soldiers showed that through the wearing of improper shoes for many years the position of the bones of the feet, in a majority of cases, had become permanently abnormal, thus leading, of course, to improper balance of the weight of the body, improper walking, and tending to produce all sorts of sores and growths on the feet.

What is happening to the feet of millions of American men and women is shown in the accompanying reproductions of X-ray photographs. One shows the foot of a man of 25 incased in a shoe of practically standard lines, which was sold as "built to fit the foot." It is easily seen that the bones of the fourth and fifth toes are bent under and inward at an angle of 45 deg., while the bones terminating in the great toe describe a sweeping curve toward the middle of the foot which is far from the normal. Another X-ray picture shows the foot of a soldier with his marching equipment on his back—the bones of the foot naturally spreading apart under pressure—and wearing the new army shoe. It will easily be seen that the bones are practically in their normal position, expansion being permitted by the design of the shoe. Repeated marching tests made with troops wearing all the new and old varieties of army shoes proved conclusively that the new shoe is as superior in practice as the X-ray shows it should be.

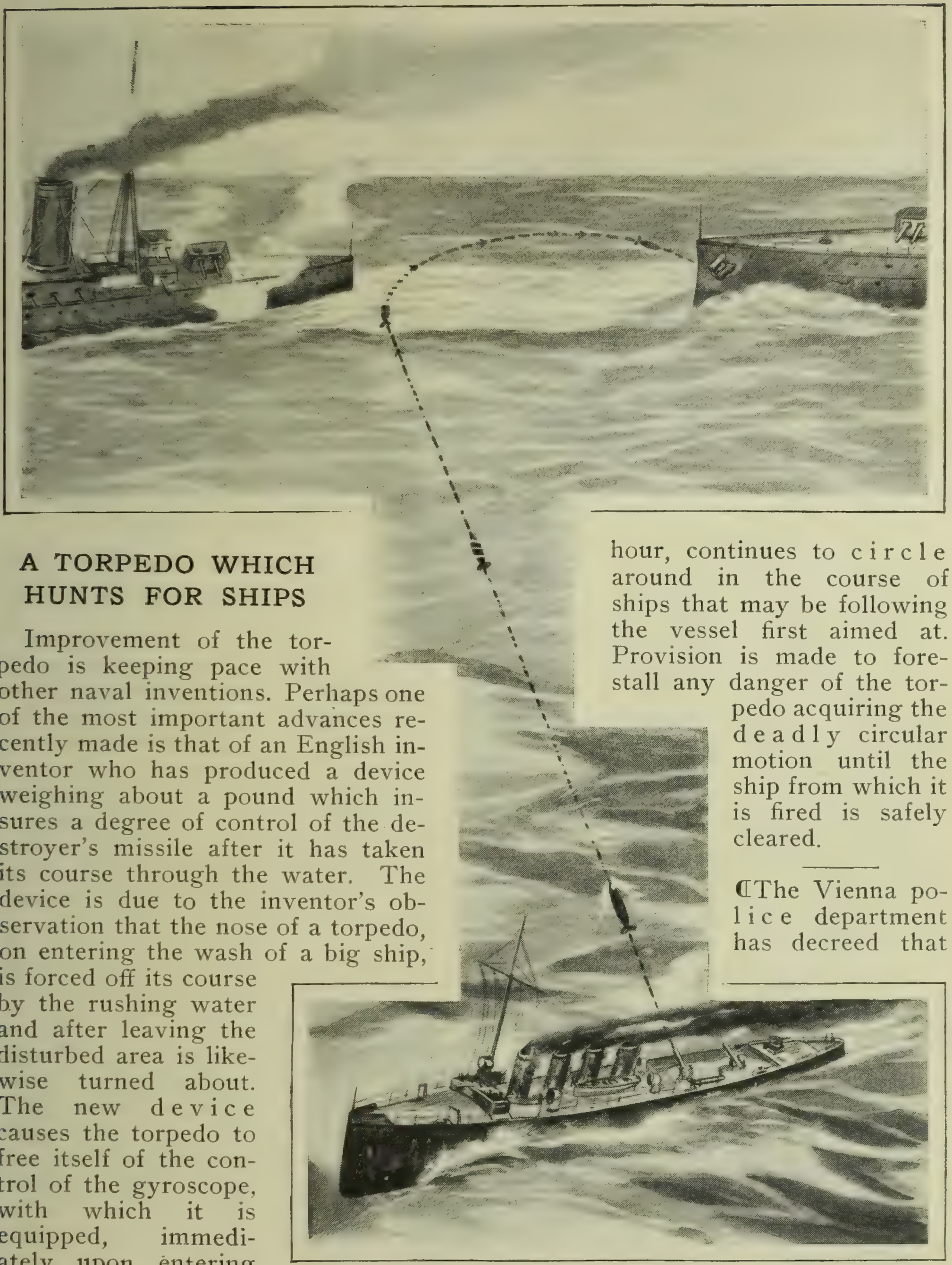
So important do the military authorities regard this matter that the new shoe is to be the only type which officers and enlisted men will be permitted to wear with their uniforms. It will be made in a tan leather, and all three varieties of the old shoe, the garrison tan, the marching shoe, and the dress shoe, will be discarded forever when present supplies are exhausted.

The investigations showed that much of the foot trouble among soldiers was due also to the improper fitting of shoes. Henceforth, by an order issued by Maj.-Gen. Leonard Wood, chief of staff, company commanders of troops will be held personally responsible for the fitting of shoes to the men in their commands. They will be required to see that every soldier has shoes that fit him, and any undue proportion of foot trouble among soldiers will be held as proof of negligence and disobedience of orders upon the part of the officers responsible. It will also be a part of their regular duty to see that the men take proper and daily care of their feet, on the march as well as in garrison.

FISHING WITH AN ELECTRIC-RAILWAY CURRENT

When, recently, unusual quantities of fish were being offered for sale by dealers and peddlers in and around Lafayette, Ind., the game warden of the county, naturally becoming suspicious, set out to ascertain the source of the unusual supply. Having first assured himself that no seines or nets were in use in the district, he at last discovered two men fishing at an interurban railway bridge. One of the men from time to time indulged in the practice of striking his fish pole against the trolley wire. Then the other would gather in the dead and stunned fish which floated to the surface. Investigation proved that an insulated wire ran down the fish pole and entered the water under the bridge. The 500-volt current of the trolley wire, thus brought down into the water, shocked all the fish near the wire, killing most of them outright.

ℭThe first flight from Berlin to St. Petersburg was accomplished recently by the German airman Abramowitsch in a Wright biplane, the flight over the 1,000-mile distance consuming 21 days, while the actual flying time was only 20 hours.



New Device for Controlling Course of Torpedo Increases Its Deadliness

A TORPEDO WHICH HUNTS FOR SHIPS

Improvement of the torpedo is keeping pace with other naval inventions. Perhaps one of the most important advances recently made is that of an English inventor who has produced a device weighing about a pound which insures a degree of control of the destroyer's missile after it has taken its course through the water. The device is due to the inventor's observation that the nose of a torpedo, on entering the wash of a big ship, is forced off its course by the rushing water and after leaving the disturbed area is likewise turned about. The new device causes the torpedo to free itself of the control of the gyroscope, with which it is equipped, immediately upon entering the wash of a ship and at the moment its nose is deflected. The result is that the rudder of the projectile is jammed and the torpedo, which is traveling at a speed of about 40 miles an hour, continues to circle around in the course of ships that may be following the vessel first aimed at. Provision is made to forestall any danger of the torpedo acquiring the deadly circular motion until the ship from which it is fired is safely cleared.

¶The Vienna police department has decreed that pedestrians must cross a street in a straight line. Pedestrians caught walking down a street in its lengthwise direction are liable to a fine.

HOUSE MOVED ON SCOW AND MOTORBOAT

The moving of a house across a small lake or river on a scow towed by a motorboat is not unusual, but, although it is a motorboat and scow that figure in the accompanying illustration, this moving operation is unusual in that the motorboat is used not only for towing, but to support part of the house as well. One half of the house, which was moved across the Kalamazoo River, at Saugatuck, Mich., was supported by the motorboat and the other half by a small scow. A hill climbing followed, the destination being the highest point in the vicinity.

House-Moving across a River

TUBERCULOSIS DISCOVERED IN CHICKENS

Few think of the possibility of the chicken eaten for dinner being affected with tuberculosis, but two scientists have just found that 10 per cent of the chickens in France have this disease, while as high as 28 per cent of the chickens from some other countries are troubled in the same way. Such chickens, when they have had the disease for some time, have long thin legs, the fatty tissue is absent, and the skin so transparent that the muscle can be seen. The chickens which have the disease seem to have been fed on the milk of infected cows.

COWBOY SADDLES HIS AUTOMOBILE

A cowboy owner of an automobile, Waddington by name, claiming Cisco, Tex., as his home, has saddled the "pesky critter" to make it seem more like the kind of mounts he is used to. The saddle is strapped over the bonnet of the automobile, and his friends say the way he can rope a steer while seated astride a hot engine is a sight to behold.

An Automobile Saddled by a Cowboy to Make It Seem More Natural

When Waddington faced the camera for the picture from which the accompanying illustration is reproduced he sat in the saddle to throw the lariat, because it is just the way he would have done if the saddle had been on his broncho, and he felt quite as sure of his mount.

TESTING TOBACCO AS A GERM KILLER

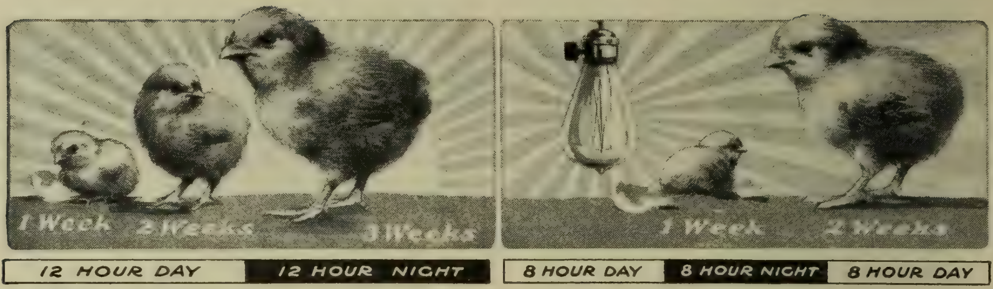
It is said that as far back as 1889 the money spent for tobacco in this country amounted to 20 per cent more than that spent for bread. Since that time the per-capita consumption of tobacco has increased largely, and the proportion of persons using it is said to be greater. The expenditure now must therefore still farther outrun the expenditure for the staff of life. In defense of such an enormous outlay for what must essentially be considered a luxury, no very strong arguments have been so far offered.

Now, however, Doctor Fullerton, of Cleveland, comes to the front, in favor of tobacco, and says it is a germ killer, both when smoked and when chewed, killing germs in the mouth, or so disabling them as to render them practically harmless. He conducted some very careful experiments with sterilized tobacco juice, obtained under conditions similar to everyday methods, and also with the smoke. The juice was applied to pure cultures of the diphtheria germ, the typhoid-fever germ, and various other kinds, producing abscesses, blood poisoning, etc., with the result that from 15 to 98 per cent of the germs were killed by the tobacco juice in one hour, while a treatment of 24 hours killed at least 84 per cent and in some cases totally exterminated them. The smoke from three grams (.1 oz.) of tobacco killed from 31 to 100 per cent of the same germs.

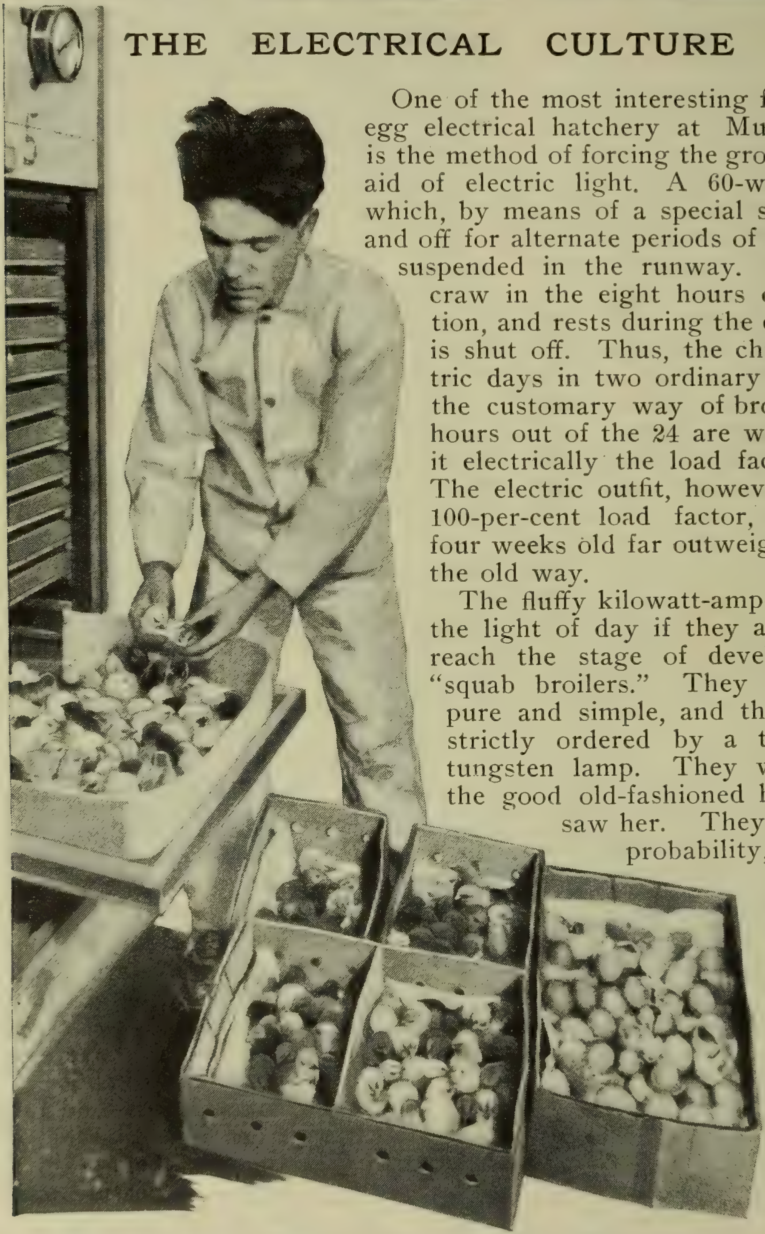
As most of these germs inhabit the mouth and either produce disease in the person harboring them, or may be conveyed to other persons, the "weed" seems to have something in its favor to counterbalance the injury its nicotine is said to do the system. In some analyses made in the chemical laboratory of the London Lancet recently, it was found that the pipe is the most harmful method of using tobacco, and that the smoke of perique tobacco contains the highest percentage of nicotine, the smoke of high-grade cigarettes contains much less, while that from a clear-Havana cigar holds the least, and, therefore, is the least objectionable form of the weed.

FLOOR ILLUMINATION FOR HOSPITALS

Placing light units under the floors of hospital wards is proving a practical auxiliary to the regular lighting system. Such units are being used in the German Hospital, New York, the floors above the lamp pits being, of course, glass, and the sides and bottom of the pit being lined with a reflecting surface.



THE ELECTRICAL CULTURE OF CHICKS


Chicks Just Hatched in Electric Incubator, on the Way to Electric Brooder

One of the most interesting features of a 30,000-egg electrical hatchery at Muskogee, Oklahoma, is the method of forcing the growth of chicks by the aid of electric light. A 60-watt tungsten lamp, which, by means of a special switch, is turned on and off for alternate periods of eight hours each, is suspended in the runway. The chick fills its craw in the eight hours of electric illumination, and rests during the eight hours the light is shut off. Thus, the chicks live three electric days in two ordinary sunshine days. In the customary way of brooding chicks, eight hours out of the 24 are wasted, or to express it electrically the load factor is 66 per cent. The electric outfit, however, is run at nearly 100-per-cent load factor, and electric chicks four weeks old far outweigh chicks brooded in the old way.

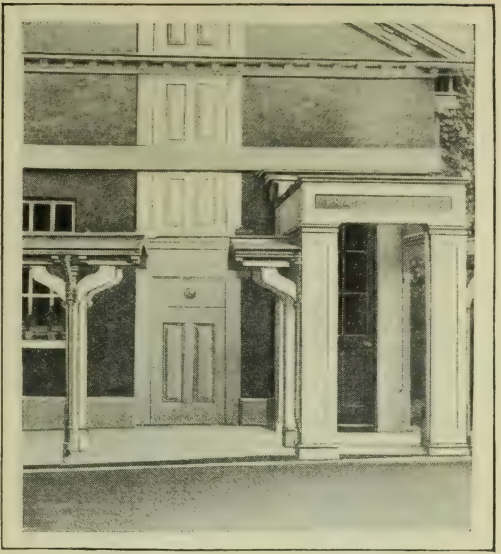
The fluffy kilowatt-ampere chicks never see the light of day if they are only destined to reach the stage of development known as "squab broilers." They are electric squabs pure and simple, and their lives have been strictly ordered by a time switch and a tungsten lamp. They would hardly know the good old-fashioned hen mother if they saw her. They would not, in all probability, respond to her agitated clucks, for their life schedule has been to eat eight hours, rest eight hours, then eat again for eight hours, and thus gain eight hours on Mother Nature.

The hatchery is a low brick building about 20 ft. square, and the large capacity of the incubator is attained by placing 20 trays one above the other, so that 5,000 eggs fill a single chamber about 2 by 4 by 4 ft. in dimensions. This arrangement of the trays is made possible by the use of an electrical fan, which drives a blast of warm air through the mass of eggs from top to bottom, and heats or cools the mass at the will of the operator. A duplicate fan is kept always at hand, for a sudden stop in the movement of warm air among the trays would result in all the eggs having to be thrown away. Reliability of current is, therefore, a big feature of the success.

THE NECESSITY FOR SPEED-BOAT COSTUMES

Racing automobilists and airmen are adequately provided with costumes fitting the requirements of each, but, as yet, the driver or pilot of the racing motorboat has not been given special attention in this matter. That the hydroplane driver is very much in need of an adequate costume, however, is clearly shown in the accompanying illustration. Seated on the stern of the "Al Parnel, Jr.," a speed boat of the east, is one of its pilots. He is wearing a pair of socks, a bathing suit, a life preserver and a pair of automobile goggles.

WHERE THE WORLD BEGINS

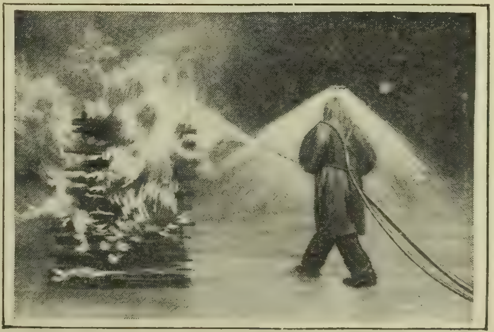


The Center of the Door is the Beginning of the World

The beginning of the world, all pedants to the contrary, is the center of a door of the Royal Observatory at Greenwich, Eng. The transit circle which marks the zero meridian passes directly through the center of this door which is the middle one, and is opened when an observation is being made. The center of the door is thus 0 deg. longitude—the beginning of the world.

FIREMEN AS WALKING FOUNTAINS

A German inventor proposes turning the firemen of Berlin into walking fountains in the manner shown in the illustration. He claims that the water-spraying device worn on the head, and fed by a second hose, makes it safe for firemen so equipped to approach much closer to the flames than under ordinary conditions. He calls the idea a "wet uniform."



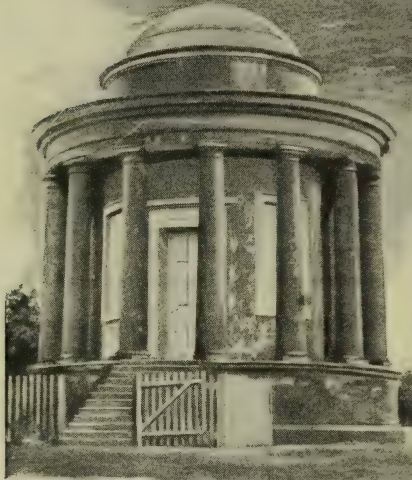
The "Wet Uniform": A Fireman Converted into a Walking Fountain

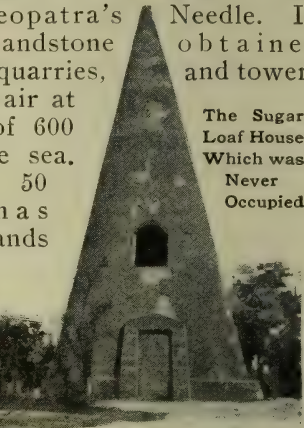
QUAINT STRUCTURES OF AN ENGLISH VILLAGE

England has many quaint villages in which may be found curious old structures that are the delight of the tourist. It is probable, however, that a close search of the isle would fail to disclose a more interesting collection of queer buildings than may be found in the remote village of Brightling.

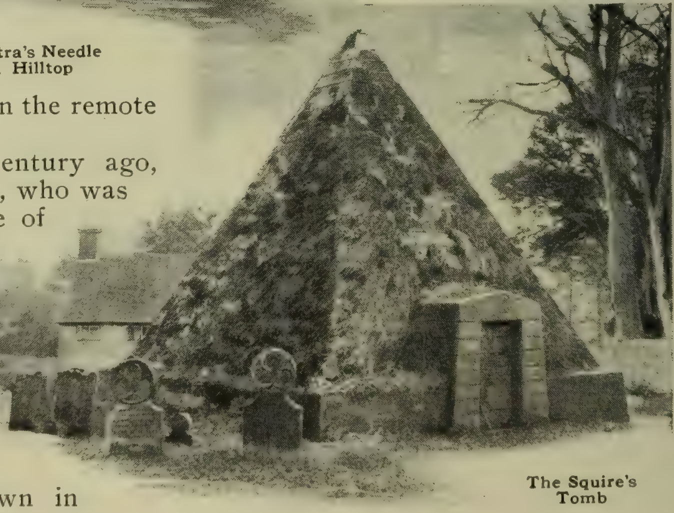
Here, about half a century ago, there lived Squire Fuller, who was the important personage of the place and possessed of considerable wealth. At the height of his career he spent a great deal of his money in the construction of numerous strange edifices, five of which are shown in the accompanying photographs. One of these is an obelisk which came to be known as Cleopatra's Needle. It is built of sandstone obtained from local quarries, and towers 100 ft. in the air at an altitude of 600 ft. above the sea. During the 50 years it has stood thousands of visitors have carved their names on its base. The "Observatory" is shown in an-

The Squire's Observatory


Solomon's Temple


The Sugar Loaf House Which was Never Occupied

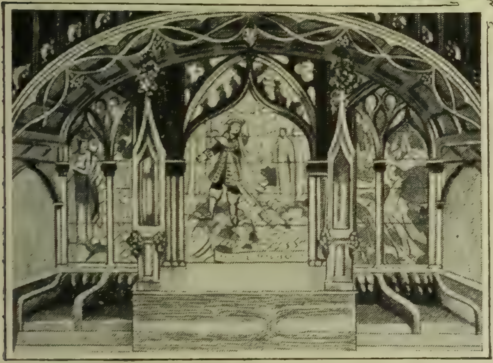
Cleopatra's Needle on a Hilltop


The Squire's Tomb

other picture. In the dome a telescope was placed by the eccentric squire which enabled his tenant farmers to observe their cattle in distant fields. "Solomon's Temple" bears some resemblance to an oriental mosque. The massive pillars are of marble. Tradition has it that this dignified structure was used by the squire for card playing.

The "Sugar Loaf House" was designed for a singular purpose by "Mad Jack," as the village worthy's neighbors dubbed him. He was anxious to immure therein for seven years a man who during that period was neither to shave, wash, cut his hair nor hold communication with the outside world. Food was to be passed through a small boarded window. As a reward the victim was to be made a gentleman for life. It is not on record, however, that a recluse of the submissive type sought by the squire ever was found.

Like one of the Pharaohs the fantastic architect is taking his final rest in a pyramid of his own design, and constructed, like its Egyptian counterparts, of huge blocks of stone. The inside is artistically decorated and the walls bear quotations from the squire's favorite authors. The coffin was placed on a stone trestle and, the natives declare, the key by which the door was locked was afterward destroyed.

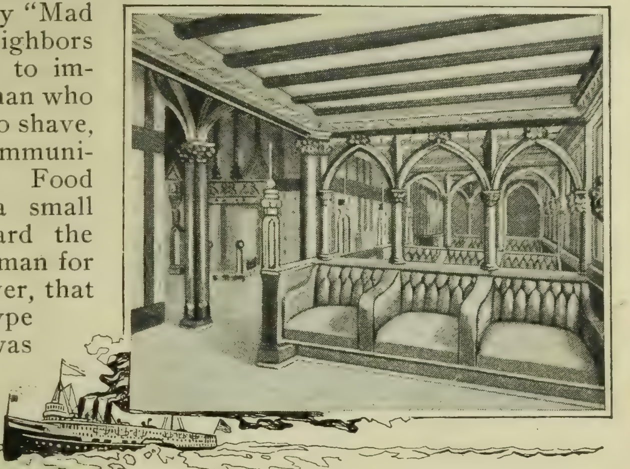


The LaSalle Window in the Gothic Room of the New Steamer "City of Detroit III"

GREAT LAKES HAVE LARGEST SIDE-WHEEL STEAMER

The new steamer "City of Detroit III," which runs between Detroit and Buffalo, is the largest side-wheel passenger steamer in the world, having a length of 470 ft., a breadth of 55 ft., and a depth of 22 ft. Her speed is 21 miles an hour.

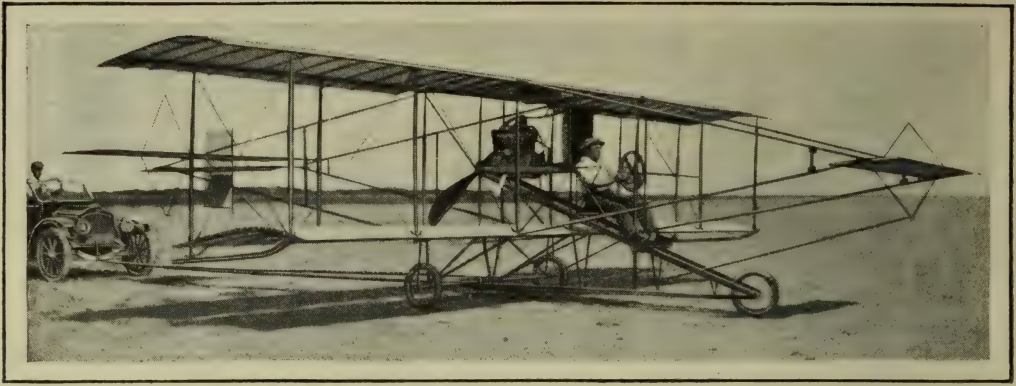
The hull of the vessel is constructed of mild steel, with a double bottom divided into 11 compartments by watertight cross-bulkheads extending from keel to main deck. The bottom is divided at the center line and athwartships into 15 watertight tanks, which can be used to vary trim and draft by means of water ballast.



The Beautiful Gothic Room, Which is Provided with a Fine Pipe Organ

The boat has 600 staterooms, 25 private parlors with bath and private verandas, and 50 semiparlors with private toilets. All staterooms have telephones which are connected with the shore service when the boat is in port at Detroit or Buffalo. The decorations are said to be the finest on any lake steamer. A Gothic room, provided with a fine organ, and the palm room with its fountain are interesting features.

℄ Only two milligrams (about .3 grain) of radium are produced from a ton of ore.



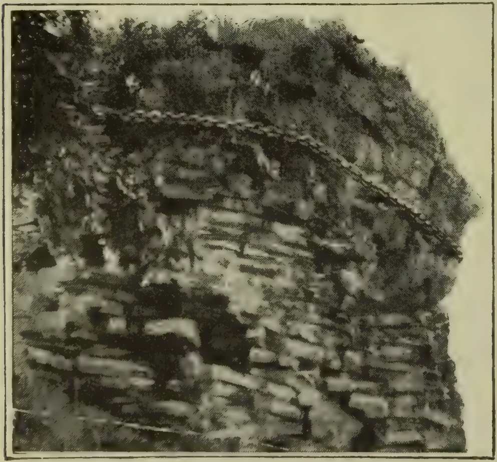
A Biplane Towing a Stranded Automobile Back to Camp

STRANDED AUTOMOBILE TOWED BY AEROPLANE

An automobile used to carry aid to airmen when forced to land at a considerable distance from the hangars of the aviation field near Fresno, Cal., broke down recently when on one of these missions. It was towed back to the hangars by a Curtiss aeroplane, which proved adequate for the task.

NATURAL ROCK CHAINED IN POSITION

In a bluff overlooking Green Lake, Wisconsin, is a natural rock, which was gradually slipping out of place and in danger of falling at any time. In order to preserve it as a natural feature of a summer home, the owner had it chained as shown in the accompanying illustration.



Holding a Natural Rock Formation in Its Place by Means of a Chain

RAINBOW COLORS FOR COPPER SURFACES

Copper and copper alloys such as brass and bronze have been used for centuries for purposes of decoration, but it was not until this fall that a "true blue" and other color finishes for this metal have been discovered.

Prof. W. B. Bancroft, of Cornell University, found that if an object made of copper, a vase, for instance, be carefully cleaned and polished and put into a solution of copper acetate, commonly known as verdigris, a pale brown deposit will form on the copper when a current of electricity is passed through the solution, as in ordinary electroplating. The copper acetate may be purchased from a druggist, or made by dissolving copper in vinegar, and the electrolytic solution is prepared by dissolving 1 oz. of the copper acetate in 100 oz. of water and adding 1/3 oz. of gelatine. The current of electricity may be generated by dry cells such as are used in many automobiles.

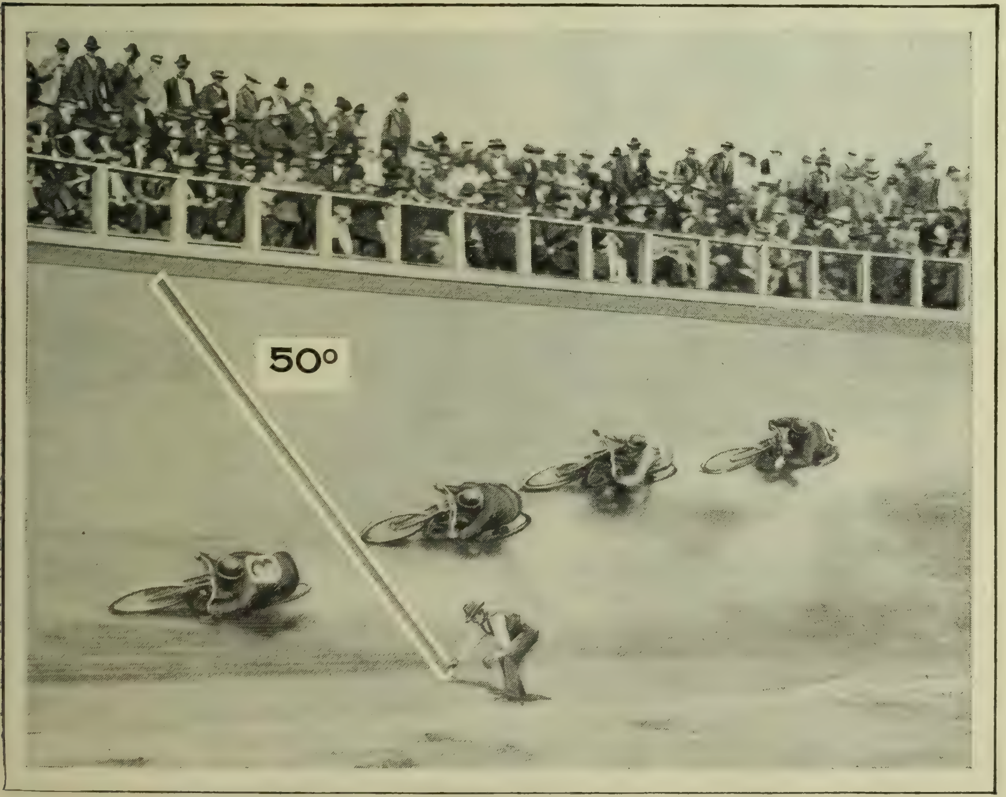
If, thereupon, the vase is hung in a stronger solution of the copper acetate containing one part of this substance to 20 parts of water, and an electric current sent through it as before, the brown of the vase rapidly changes and many other very pretty colors are obtained, until at last the whole vase becomes a magnificent peacock blue. By heating the solution to a temperature of 122 deg. F. when the current is passed, the vase is colored a brilliant red, while if the current is allowed to pass for only a few moments at a temperature of 135 deg., the deposit is of the color of gold, and iridescent, showing all the colors of the rainbow. By varying these processes copper can be given many extremely beautiful colors, which will last for many years if covered with a lacquer.

One great advantage of this process is that it is extremely cheap, and copper thus finished will, no doubt, find a wide use in the interior decoration of buildings.

RACING TRACK IS BANKED TO FIFTY DEGREES

Los Angeles claims to have the steepest motorcycle racing track in the world. The track is circular, being one-third of a mile in circumference and having the entire surface banked at an angle of 50 degrees. This angle is so steep that a terrific speed must be attained before the riders can mount to the top of the huge saucer, and a long inclined runway is used by the racers to gain speed before they strike the track itself. A speed of at least 50 miles an hour must be constantly maintained or else the riders would be thrown to the bottom of the track, and speeds of over 90 miles an hour are reached in every race.

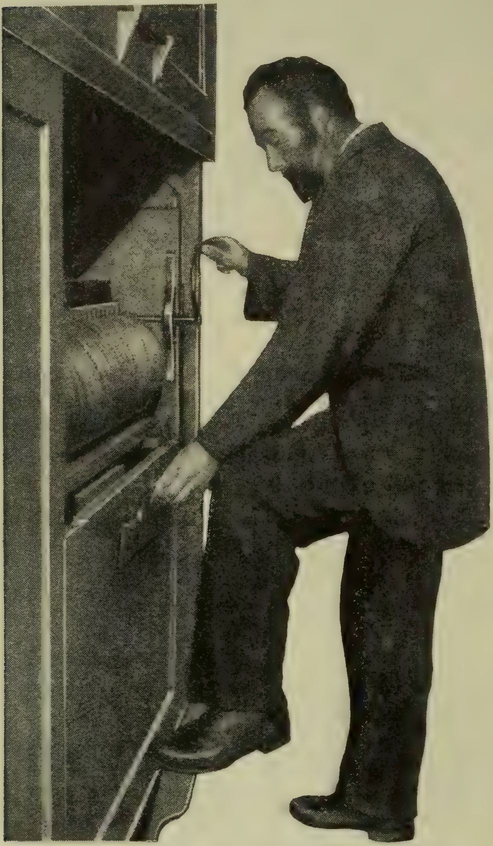
ℭThe British army has adopted a complete wireless-telegraph outfit that can be carried in the knapsacks of four men. The knapsack stations have a range of about 10 miles.



The World's Steepest Motorcycle Track, Showing the 50-Deg. Incline

OLD BARREL ORGAN IN ENGLISH CHURCH

In a church at Brightling, in England, is a barrel organ that has been steadily used since the early part of the eighteenth century. It still possesses an exceptionally good tone, which has been declared equal, if not superior, to that of the average pipe organ, which its tones so closely resemble, that the congregation could scarcely tell the difference.



Operating Ancient Barrel Organ in English Church

Considerable skill is required to play this organ, for it has six stops which have to be manipulated with the left hand, while the right hand is turning the handle and the air is being pumped in with the left foot. Two rolls of music are provided, each containing 12 tunes comprising Easter hymns and selections suitable for ordinary services.

ELECTRICITY FROM COAL BY NEW METHOD

The possibility of producing electricity direct from coal without the medium of the steam engine and the dynamo, is a question that has been given attention by scientists for some time. Interesting experiments which seem to promise a solution of the problem have recently been carried on by J. A. Harker and G. W. C. Kaye, in the British National Physical Laboratory.

In the course of their investigations they succeeded in producing an alternating current by the use of two properly connected carbon rods, one of which was constantly heated in a furnace, while the other was alternately heated and cooled by being moved into or out of the heated region. Similarly, a direct current was generated when the latter rod was kept constantly cold, by water cooling, for instance. Thus there has been discovered something entirely new in electrical science; a thermoelectric couple, the elements of which are of the same substance, so that the difference in temperature alone accounts for the generation of current.

If this method can be developed into practical industrial applicability, and currents of sufficient strength thus generated, it is evident that a revolution in power production will result. Besides—it is pointed out—any part of the furnace heat not required for the generation of current could be used for other purposes.

CASTING A HUGE ENGINE BED

A remarkable casting recently turned out in this country was an engine bed weighing 120 tons. Five air furnaces were charged with metal of the same average analysis, the melting was so regulated that all the furnaces were ready for tapping at approximately the same time, and the molten metal was tapped simultaneously into six ladles, four of which were poured at the same time. The contents of the two remaining ladles followed immediately afterward.

COMPLETED PORTIONS OF PANAMA CANAL CUTS

Upper Picture: Looking through Bas Obispo Section
Lower Picture: Part of Culebra Cut

Two photographs showing completed portions of excavation work in the most difficult cuts of the Panama Canal are here reproduced. One of them shows a part of Culebra Cut which is 300 ft. wide at the base. All work within range of the photograph is completed except grading and cleaning up. The other illustration shows a completed section of Bas Obispo Cut, all that remains to be done here being also a cleaning and grading.

NEW ACID-RESISTING ALLOY

When it is required of a metal apparatus or machine that it should withstand the action of acids or of corrosive vapors, it is customary to cover the parts with platinum. This method of protection, while practicable 15 years ago when platinum could be bought at a comparatively reasonable price, cannot now be used so widely with platinum selling at $47 an ounce.

For this reason, the discovery made by Prof. S. W. Parr, of the University of Illinois, of an alloy which can be made cheaply, and which is noncorrosive, is a very timely one. Of this new alloy Professor Parr constructed a so-called bomb calorimeter, which is employed in tests of the heat value of coal, and therefore must be acid-resisting, and it was found that, after continued use, the inside of the bomb remained as bright as if it had been made of platinum or gold-lined steel, the material formerly used.

The alloy contains about 67 parts nickel, 18 parts chromium, and smaller amounts of copper, tungsten, aluminum, manganese, titanium, boron, and silicon. It is probable that this alloy, or a slight modification of it, will find a very wide use in many industries.

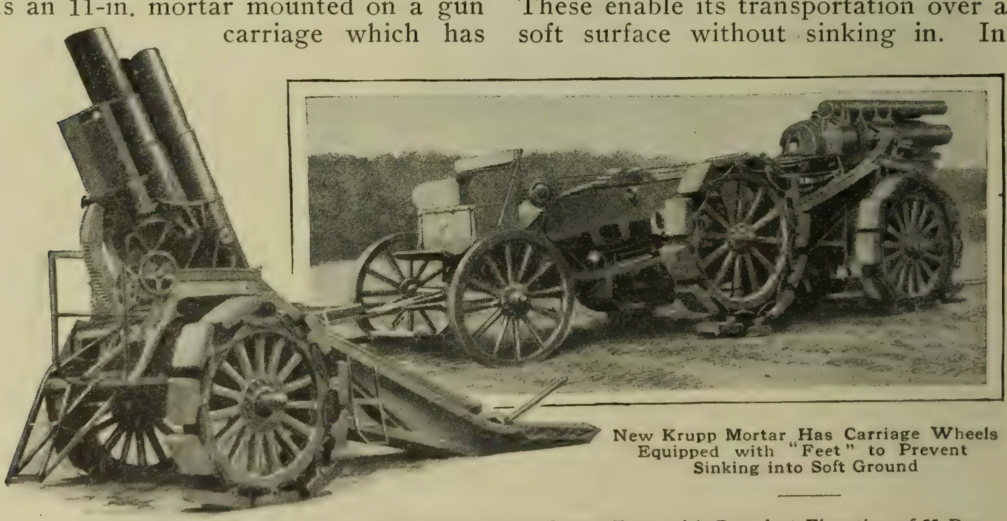
TRAIN DISPATCHER'S PLAN FOR HOTEL MAIDS

An electric apparatus for tracing the movements of chambermaids in hotels, somewhat on the lines of a railway-dispatcher's system, has been invented and put into use in a Minneapolis hotel. The apparatus provides two ways of determining the presence of a maid in any of the guest rooms. The door of the room is equipped with a small electric light—at least the light is placed on the wall in the corridor just outside the door. When the maid enters the room she is required to insert a key in a plate, which is also in the wall, and this causes the lamp to light and remain lighted until the key—or plug, as it might be called—is removed. At the same time another light flashes on a board in the main office of the hotel, and tells the observer that a maid has entered a certain room. The lamps can also be lighted from the office so that if a certain room is to be made ready on short notice, the light is turned on and the maid having charge of that corridor, seeing the light, knows that the room is in need of attention. She turns off the light when she has finished.

ℭIrrigation is proving especially valuable in parts of South Africa where the rivers contain salts. In many cases considerable deposits of the salts have gradually gathered in depressions surrounded by trees and rushes and great quantities of this salt are carried over the land by irrigation, much to its improvement.

HEAVY MORTAR CAN TRAVEL OVER SOFT GROUND

A new type of field gun has recently been produced at the Krupp plant. It is an 11-in. mortar mounted on a gun carriage which has wheels fitted with broad feet, as shown in the accompanying illustration. These enable its transportation over a soft surface without sinking in. In



New Krupp Mortar Has Carriage Wheels Equipped with "Feet" to Prevent Sinking into Soft Ground

Artillery Piece of New Type with Barrel at Elevation of 65 Deg.

firing, the gun is left on the mounting carriage and the forward carriage detached. The new mortar has an elevation of 65 deg. Horizontally it may be moved a few degrees to the right or left. The range of the gun at maximum elevation is 4½ miles or more, while at 42½ deg. elevation the range is nearly 6¼ miles, the same charge being used in both instances. The length of the gun is 11 ft. Transportation of the piece is effected by two motor cars, one carrying the barrel, while the recoil brake and air reservoirs are taken on the other.

RUDDER AMIDSHIPS ON NEW HYDROPLANE

Photo by H. W. Blair, Wilmington, Del.

Hydroplane "Tech, Jr.," Equipped with Rudder Amidships

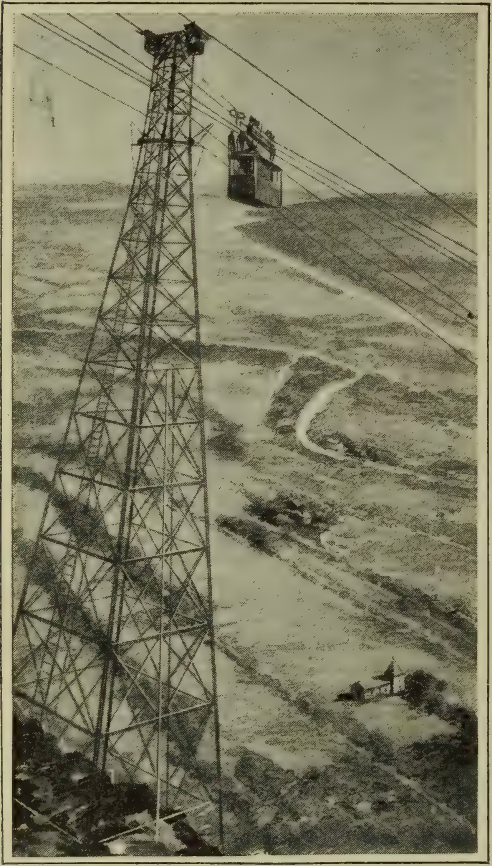
In building boats of every description it has always been the custom to place the rudder at the stern, yet T. Coleman du Pont, of Wilmington, has done just the opposite and has had his new boat built with the rudder forward of the midship section, as the accompanying photograph shows. This boat, the "Tech, Jr.," is a hydroplane, 20 ft. long, and, driven by an engine of 150 hp., she has made 43⅛ miles an hour. It was thought that by placing the rudder forward, it would not only be out of the way of the propeller and give the latter more free water, but that when the boat was going at full speed, only the blade of the rudder would be in the water and at the same time, in making turns, it would keep the boat from skidding, as boats of this type are inclined to do.

ELECTRICALLY LIGHTED TENNIS COURTS

At the Lakewood Tennis Club, Lakewood, Ohio, is an electrically illuminated court which is, apparently, perfectly practical and a tremendous success. The court is thoroughly illuminated without the glare of the lamps disadvantageously affecting the eyes of the players. Eight lamps, especially designed for tennis-court illumination by a Cleveland concern, are suspended on each of the two sides of the court in the manner shown.

A Game in Progress on an Electrically Lighted Tennis Court in Lakewood, Ohio

HIGHEST AERIAL RAILWAY FOR SIGHT-SEEING



Passenger Car on Switzerland's Newest and Highest Aerial Tramway

The highest aerial tramway in Switzerland, recently built for no utility purpose, but only to provide daring tourists with an easy ride to the top of Vigiljoch, in Tirol, and a magnificent view over the valley below, is shown in the illustration herewith. The upper station lies at a height of about 4,800 ft. and the lower at 1,000 ft., the whole length of the span being 7,200 ft., or approximately 1½ miles. The little car is equipped to carry passengers also on the roof.

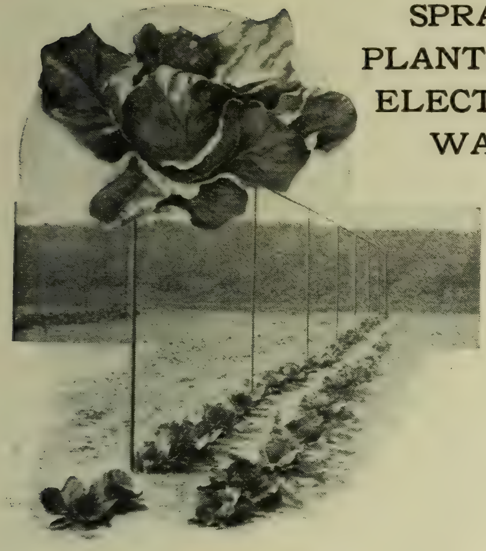
ℭA leather cigarette case, with a piece of sole leather or wood to keep the plugs apart, provides an excellent holder for two spare spark plugs.

EELS MEET DEATH TRYING TO IMITATE SALMON

While it may not be right to state that the eel is the monkey of the sea, at the same time the imitative faculty possessed by the eel is responsible for the death of large numbers of them in the waters of the northwestern portion of the United States where salmon abound. The salmon, as is well known, have the ability to go upstream and even to climb up waterfalls. For a number of years fishermen in the Willamette and Columbia Rivers have found large numbers of dead eels at certain seasons of the year. There was no explanation of the cause of this condition until a short time ago when one of the fish and game wardens undertook an investigation which developed the fact that the eels met their fate in attempting to imitate the salmon in going upstream. It appears that the eels managed to do fairly well as long as there was only an even stream, but when the waterfalls intervened their fate was almost immediate. They would attempt to climb up the face of the fall, be washed back and crushed by the weight of the water. During the month of July, 1912, more than 60 tons of eels were gathered from the river. They have been used as food for the young salmon the government is breeding at one of its large fish hatcheries.

ℭAmong other benefits to mankind wireless appears to be destined to rid the notorious West River of China of the pirates that have claimed the attention of the navies of the world to the extent of compelling them to maintain a regular guard for commerce. The equipment of West River commercial boats with wireless enables them to summon assistance when attacked, as was shown recently when a gunboat received a call and managed to capture an entire pirate outfit just as it had swooped down on a cargo boat, the latter having sighted the pirate and sent out the call by its wireless apparatus.

SPRAYING PLANTS WITH ELECTRIFIED WATER



Irrigation by Spraying with Water Not Electrified Gave Fair Results

Irrigation with Electrified Water Produced the Largest Crops

Electrifying water for use in irrigating plants has brought promising results in a crop test by the inventor this past summer, excellent yields of vegetables being obtained in very poor soil on Long Island. The discovery is an evolution from efforts to kill locusts by spraying. The original apparatus was erected in Argentina, the inventor being spurred to success not only by the rewards offered by the government but by the suffering of the people through the destruction of their crops by huge swarms of locusts. When the locusts had been effectually disposed of, there was suggested the utilization of the same apparatus for spraying the plants with water, and when success followed this work, the inventor found that much greater crops could be obtained by electrifying the water and this he proceeded to do with remarkable results.

The system is very simple. The water, drawn from a river, stream or artesian well, is raised to a suitable height by a motor or traction engine. Two high towers may be installed, from which pipes are suspended, supplying circular, automatically revolving spray nozzles, and thus five to ten acres of land can readily be given an evenly distributed shower of rain, of whatever amount required.

When it is desired to use electrified water, the water is first pumped into a reservoir consisting of an iron tank placed on an insulated support, and charged from a dynamo. The iron wall of the tank serves as the positive pole, while the negative pole consists of a copper wire, all insulated except the tip. By the chemical reactions which take place in the water certain products beneficial to the plants are said to be formed.

For the test this summer on Long Island, a strip of barren, sandy soil was secured. Vegetables were planted and some of them were irrigated with plain water, while another section was irrigated with electrified water. The results were conclusive. The plants that had been given the benefit of the electric treatment seemed to grow more rapidly and to reach a higher development. The cost of installation is estimated at from $50 to $100 per acre, according to local conditions, but the inventor believes that the benefits to be derived from the system will result in vastly greater profits than the cost of installation. The cost of maintenance is nominal.

WATERING CART PUMPS ITS OWN SUPPLY

A good-roads system has been developed in the rural districts of California by means of watering carts which have a gas-engine attachment for pumping water. Wells are provided at intervals and the engine pumps the water directly into the tank of the cart, thus eliminating the cost of windmills or pumping plants. On account of this decreased cost in wells, many more are bored than it would be otherwise possible to afford, and the cart is driven steadily ahead, from well to well, not having to make return trips over the same territory for water.

Gas-Engine Pump on Watering Cart Provides for Supplying Cart from Wells

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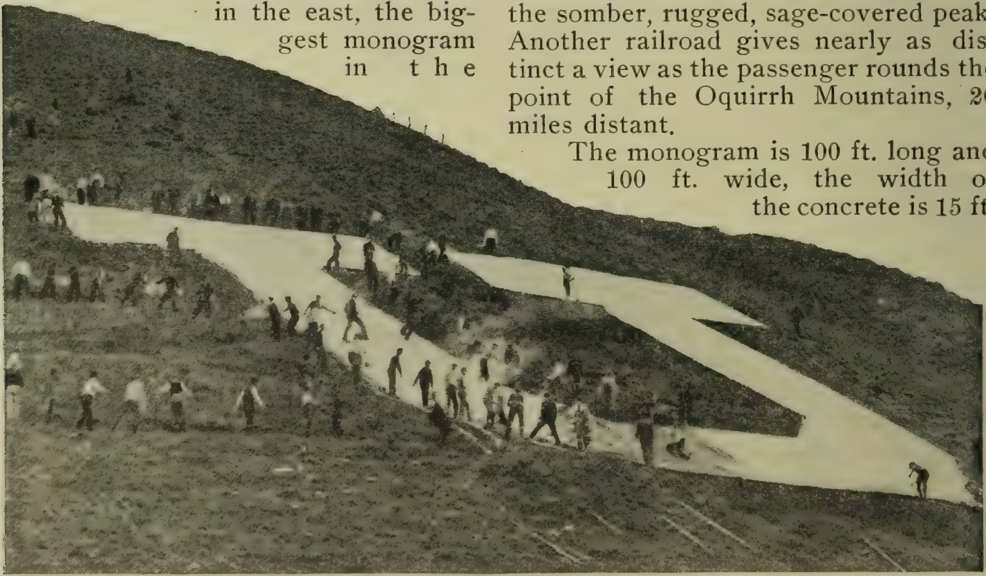
ℂAn electric-railway company supplying electricity to the cities of Rensselaer and Hudson, N. Y., as well as to a large rural and village territory between these communities, operates a special show train of two cars, equipped with a full line of electrical appliances, such as motors, pumps, mills, suction cleaners, washing machines, and the like. The cars stop a day at each of the stations.

THE LARGEST MONOGRAM IN THE WORLD

From railroad trains in the Salt Lake Valley, within a few miles of Salt Lake City, one can see on one of the great mountain slopes of the Wasatch Range in the east, the biggest monogram in the world. It is a monolithic concrete letter—U—the initial of the University of Utah. Six miles away, it stands out in gleaming, white distinctness against the somber, rugged, sage-covered peak. Another railroad gives nearly as distinct a view as the passenger rounds the point of the Oquirrh Mountains, 20 miles distant.

The monogram is 100 ft. long and 100 ft. wide, the width of the concrete is 15 ft.



Students of the University of Utah Giving the Largest Monogram in the World Its Annual Bath and it is 8 in. thick, and the whole covers a plot of ground equal in size to three ordinary city lots. Nearly 600 bbl. of concrete were used in forming this gigantic letter.

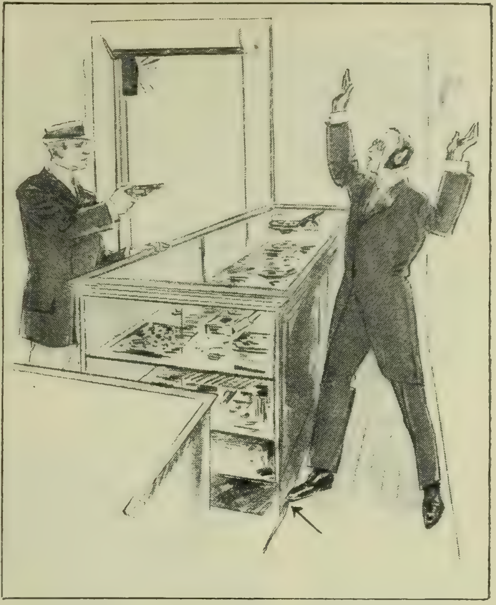
How the suggestion for such a monogram in such a place originated is not known, but in 1905 the students of the university determined to carry the idea into execution, and they assembled on that mountain slope, dug out a foot-deep trench to form the letter, and filled it with limestone found in the neighborhood. Its appearance at first was as emphatic as it is today; but dust and dirt filled in between the limestone rocks and soon turned the great monogram to a dull gray.

Two years later, therefore, the students removed the limestone and replaced it with concrete. When it is considered that the slope is one of 40 deg., and that no team can approach within a half mile of the spot, the tremendous difficulty of transporting material and tools to the place, and of performing the work itself, is fully apparent. But the boys did it, and they state with pride that not one nickel was paid for outside help. It was purely a college achievement.

Every spring, on an appointed day, the entire college force cleans the "U." They go up there with brooms, scrapers, buckets and lime, and after sweeping and scraping the concrete they give it a spring dress of whitewash. The co-eds go along with luncheon baskets and feed the husky, voracious students. Then with impressive and solemn ritual they all circle round the monogram, finishing by singing the "Cleaning-up Hymn," which, it is said, was composed by a Uinta Indian student, in his native language.

HOLDUP ALARM COMBINES GONG AND GUN

That the holdup man continues a menace, even in the twentieth century and in the midst of civilized communities, is evidenced in the manufacture of the device shown in the accompanying illustration. The inventor, a Chicago man, calls it a "holdup alarm." The apparatus is designed to be placed outside of a store or saloon where the ringing of the gong warns all passers-by and the policeman on the beat of the crime that is being committed. Back of the counter or bar and running from end to end, a small, strong steel wire is placed on the floor, making it possible to operate the alarm easily from any point by simply pressing the foot on the wire, even though the victim's hands, at the command of the invader, may be up in the air. Pressure on the wire locks a lever which sets the gong ringing and fires an electric gun which is connected with the apparatus and which makes a loud report.

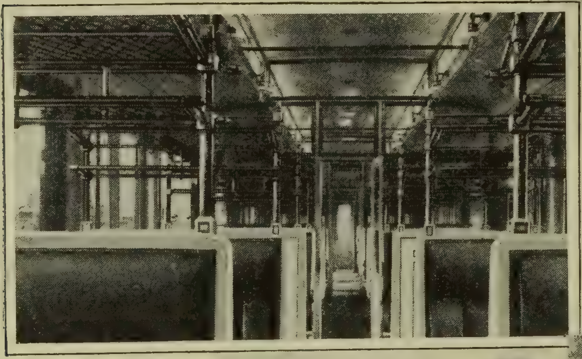


This Holdup Alarm Rings a Gong and Fires an Electric Gun

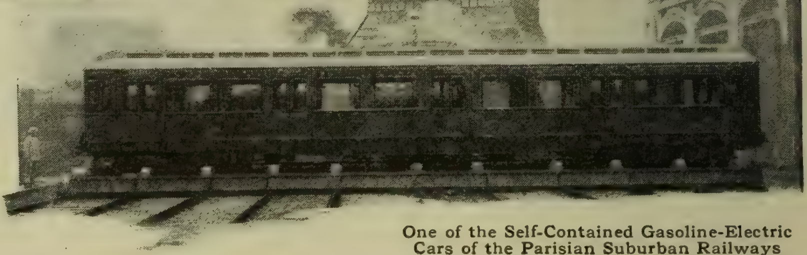
ℭThe German people treat wood in almost the same manner the Chicago packers are said to use a pig—utilizing every scrap except the rasp of the saw as it cuts a log—fiber or pulp being used to make artificial silk, bristles, paper, carpet, twine, yarn, canvas, cloth; and parquet flooring is made from sawdust.

ELECTRIC AUTO CARS OF PARISIAN RAILWAYS

Three all-steel auto cars, 75 ft. long, and weighing 61 tons, were recently placed in service on the suburban railways of Paris. Others will be added to the rolling stock if these meet all requirements. The cars are mounted on four 4-wheeled trucks, and contain one first-class, two second-class and one baggage compartment, besides a cab for the engineer at either end. The power installation consists of two 250-hp. gasoline engines, driving dynamos which generate a 600-volt direct current. The speed attained on level track is 50 miles an hour.



An Interior View, Showing Arrangement of the Seats and the Racks for Carrying Light Luggage



One of the Self-Contained Gasoline-Electric Cars of the Parisian Suburban Railways

The cars have seating accommodation for 64 passengers, and adequate standing room for 46, or a normal total of 110, but during rush hours the cars are allowed to carry a maximum of 200 passengers.

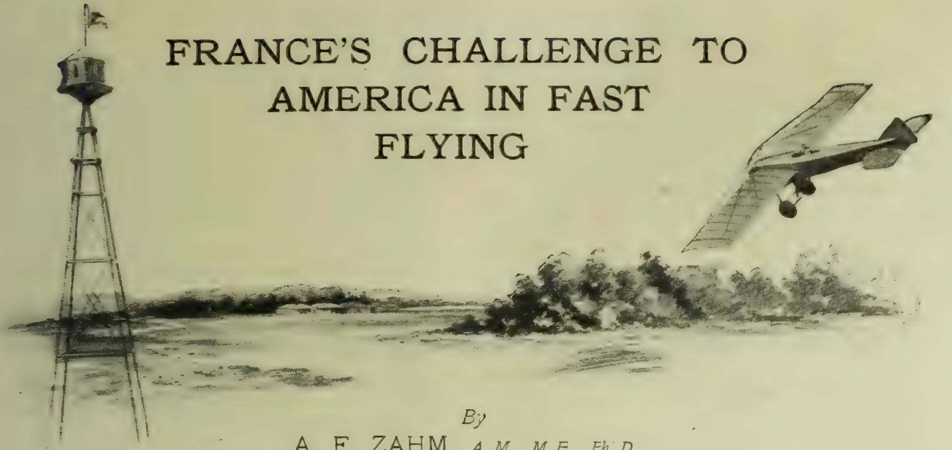
COOPERATIVE OWNERSHIP OF AN AUTOMOBILE

Although coöperative ownership of such things as automobiles, motor and sailing boats, motorcycles, and the like, has rarely proved successful, there is one instance at least, in Chicago, in which three commuters, all married, own one machine without any conflicts resulting.

The total railroad transportation of these men averaged about $70 per month, including their round trips six days a week, and about eight trips a month for each of the wives. They decided that, if they pooled their interests, a car would be just as cheap, and so it has proved; the total monthly maintenance, including $28 per month for depreciation, amounting to $60.50. The families have a written understanding regarding the use of the car. A boy brother of one of the men drives them to business and calls for them at the end of the day, and, in the meantime, the wives boss the car on alternate days. Every third Sunday one of the families has exclusive use of the car.

¶Advocates of a pure-food and drug law in Japan have brought to light the fact that large quantities of rice are sold that are adulterated with quartz and sand which were originally used for the legitimate purpose of polishing the grains and were frequently left in with grain sold in bulk by weight to increase the weight.

FRANCE'S CHALLENGE TO AMERICA IN FAST FLYING



By

A. F. ZAHM, A.M., M.E., Ph.D.

A DRAMATIC and crucial incident in our pleasant relations with the representatives of France at the Bennett aviation contest, on the ninth of last September, occurred in the evening, when the officers of the Aero Club of Illinois were entertaining the victorious Gallic sportsmen at a dinner in Chicago.

The Americans had drunk to the health of their happy conquerors, and felicitated them on their splendid performances, particularly that of Vedrines, who had flown 124.8 miles at a speed of 105.5 miles an hour, and in one lap had set a new world's record at 109.4 miles an hour. Their vivacious guests responded with characteristic felicity. They expressed for the twentieth time that day their grateful appreciation of the spontaneous welcome and constant kindly attention they had received. In conclusion, Vedrines, speaking for his countrymen, voiced the hope that they might do as graciously for American representatives at the Bennett race in France next summer. One of their hosts, a prominent clubman, assured him, half in jest half in earnest, that an American airman would of course go abroad and bring back the aviation cup to the country where it has spent two of the three years of its existence. Vedrines' aspect changed in an instant. He was no longer the modest alien, politely thanking his friends for hospitality. He, by official record made that day, and by merit of most arduous, most brilliant flying all over Europe, was now the world's greatest airman; he was the guest of honor, and, for the occasion, chief representative of France. With head erect, and eyes flashing the true sportive fire, he waved his hand to the jesting spokesman across the table, and said in a ringing voice: "I defy you to take the cup from France next year. We would rather see America win it than any other people; but in the name of my country, I defy American sportsmen to take from us the Bennett aviation cup in 1913; yes, I defy you to win it in three years in an American-made machine."

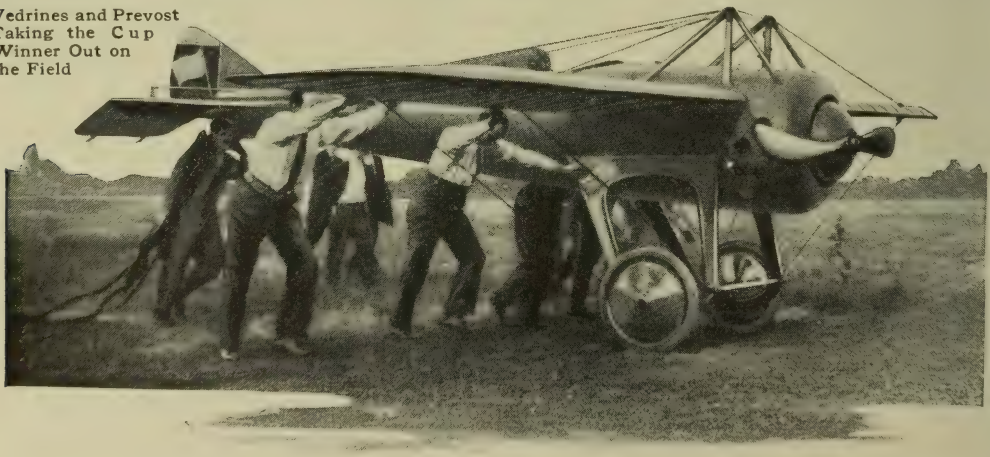
> ***"I defy you to take the cup from France next year. We would rather see America win it than any other people; but in the name of my country, I defy American sportsmen to take from us the Bennett aviation cup in 1913; yes, I defy you to win it in three years in an American-made machine."***
>
> *—JULES VEDRINES.*

The challenge was applauded unanimously. It was not received as a boast, for it had not been so given. It was the impulsive outburst of the most adroit and fiery artist of a nation known to be aviation-mad. At the last two annual contests for the world's speed championship, France had sustained glorious defeats; for on both occasions the cup had been won by an alien, educated in France and piloting a French machine. Now she was enjoying a glorious victory in which no other nation could stand even second. Vedrines' defiance therefore was cordially hailed as a challenge to all America to do something great for a noble science and art, as a challenge to our aeronautic investigators, our aeroplane designers and constructors, our airmen, our wealthy patriots and sportsmen. The challenge was issued by a pilot who cares more for the advancement of aviation than for its emoluments; a pilot who, while other airmen were flying mainly for money, had applied his best energies to develop greater speed in flight, and to that end had exerted unremitting pressure upon the designers and the manufacturer of the beautiful Deperdussin monoplane. Virtually the challenge comes from France herself, the nation which, by the coöperation of her aeronautical laboratories, her scientific designers, her specialized manufactories of propellers, of engines and of aeroplane framing, by her munificent private and governmental patronage, has, since the advent of public flying, manifested such admirable leadership in aviation.

America is too magnanimous, too wealthy and populous, to decline, without deep humiliation, such an honorable challenge. For at present the racing monoplane can not properly be regarded as a freak and useless machine. On the contrary, it is a most natural and efficient type of flier. It approximates a long conceived ideal, embodying speed, economy and security against the elements. The swift racer of today may be the normal passenger plane of tomorrow.

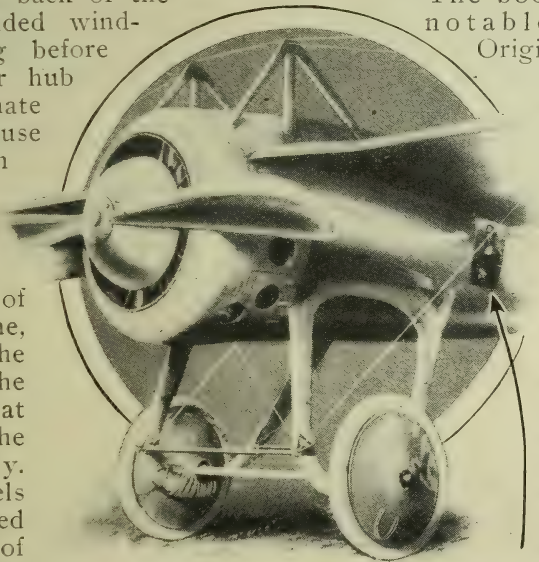
And if we accept the challenge we can hope to succeed only by strenuous, prolonged and systematic preparation. A winning monoplane is not designed in a day. Nor is the art of flying it learned in a day. Vedrines, with the gentlest movement of his left hand, guides his Deperdussin thunderbolt securely through the sky, while waving his right hand to the crowd; the most skillful American airman attempting, without careful preliminary practice, to perform that feat would promptly kill himself. The structural design and development of that famous racer was a colossal task. The designing engineer Bechereau, the constructor Sargeant, the intrepid pilot Vedrines, spent long patient months testing and modifying the type, increasing the thrust and speed step by step, first with fifty horsepower, then with seventy, then one hundred, then one hundred and forty, till Deperdussin had spent no less than $300,000. And Vedrines assures us that the development still continues, that within a very few weeks he will, by use of a small pair of racing wings, raise the speed to 200 kilometers, or about 125 miles per hour.

The development and present structure of the winning aeroplane of 1912 may well serve as a precedent and guide to us in producing a cup winner



Vedrines and Prevost Taking the Cup Winner Out on the Field for the summer of 1913. It represents Deperdussin's best effort to build a compact flier of minimum resistance and maximum efficiency, propelled by the most reliable engine, of great power and little weight.

The monoplane, in flight, resembles a headless fish provided at its fore part with rigid wings and a trim two-wheel landing chassis; at its rear with finlike horizontal and vertical rudders, the whirring propeller before the body being invisible, and the pilot ensconced in the body just back of the wings. A rounded windshield projecting before the propeller hub serves to eliminate resistance and cause the air to stream all the more swiftly and effectually past the 14 radial cylinders of the Gnome engine, rotating with the propeller about the fixed crankshaft at the front of the aeroplane body. The landing wheels also are shielded by thin sheets of aluminum attached to their sides and hiding their spokes. The framing of the wings and body presents a smooth exterior, except for the control and stay wires and their fixtures. Thus the whole machine is of elegant streamline form, and shoots through the air with arrowlike stability, resembling a great winged cannon darting blunt end forward in level poise.



On the Side of Vedrines' Aeroplane He Carried His Mascot, a Print of the Mona Lisa

Over all, the monoplane measures 21 ft. fore and aft by 19 ft. 6 in. from tip to tip of its wings, which average about 5 ft. in depth from front to rear edge. The wings, whose camber is ¾ in., look flat underneath, but quite convex above, and thickest toward the forward edge. Each wing has the usual two fixed stay wires or cables above, and two below, all attached along the forward spar, and a third stay wire fastened at the outer forward part of the wing and extending obliquely inward and rearward to attachment at the landing chassis. The cross section of the present streamline body is circular in front, where it meets the rotating Gnome engine, but more and more oval toward the stern where it terminates in a fixed horizontal fin to whose rear is hinged the movable horizontal rudder.

The body structure is a notable achievement. Originally Deperdussin employed a fuselage of rectangular cross section, framed in the usual way and tautly covered with fabric. The present body is framed of long, thin poplar strips, 5 in. wide by ⅛ in. thick, in alternate layers, bent spirally right and left around a solid fish-shaped frame and firmly glued, one layer to the other. When the solid frame is removed from the firm dry shell, the latter has a hole cut in its top for a cockpit. Within this the pilot sits on a sofa cushion, his legs extended along the floor, an oblique wind deflector before him, and a small cushion at the back of his head forming the rear edge of the cockpit. Before the bow of this shell is a circular oil shield, 3 ft. in diameter, surrounding the engine, with a clearance of an inch or more. When Vedrines in his enthusiastic explanation of the machine, struck the hull with his fist, it responded with a dull, hollow sound which gave the impression of strength as well as lightness.

Seated within the cockpit in comfortable posture, the pilot finds his duty so easy and simple as hardly to seem dangerous. With his feet he works a horizontal lever which actuates the control cords of the steering rudder in the usual manner. The pilot wheel, when pushed fore and aft, actuates the horizontal rudder, through push-rod and wire mechanism extending to rearward; and when rotated to right or left warps the wings, and thus controls the lateral poise. The warping wires wound over the steering-wheel hub pass along its supporting frame, or rocker arm, thence run vertically down through the hull to two bell-crank levers pivoted below on the chassis framing. Each bell crank has a horizontal arm extending inward of the chassis brace, and actuated by the vertical wires coming down through the hull; also a shorter vertical lever jutting downward and actuating the pair of warping wires that run obliquely up to the corresponding wing. These wires, of course, continue over the top of the monoplane in the usual way observed in the Bleriot and other machines.

The steering and balancing of the French racing machines,—the Deperdussin monoplanes of 140 and 100 hp., respectively, driven by Jules Vedrines and Maurice Prevost, as also the 100-hp. Hanriot monoplane, driven by André Frey,—seemed to be eminently satisfactory to the airmen and spectators alike. Frey unfortunately had motor trouble, which eventually eliminated him from the contest; but the other two piloted with consummate skill, with marvelous grace and precision of flight. Round the long rectangular course, with its hexagonal ends, they would shoot from pylon to pylon with the level rectilinear directness of an arrow. At each turning point the machine made a sudden tilt, grazed around the pylon like a wheeling bird, then as suddenly recovered its level without oscillation. Apparently the manipulation of aeroplanes is practically perfect for racing, so that any further refinement would not add greatly to their record for average speed.

But the process of launching and landing such swift aeroplanes is not so satisfactory. The machine runs along the earth at more than railway speed, bounding upward at every hump, and finally clears the ground or settles down to rest, as the pilot chooses. It is a dangerous performance where the ground is rough or the wind gusty and irregular. Vedrines affirms that the speed of landing on ordinary, fair turf has reached its limit. Much higher speeds in air can be readily attained; but some provision for floating the aeroplane at moderate velocity along the ground is necessary to make such racers practicable.

Various plans devised to alter the trim and diminish the resistance of an aeroplane after launching have been tried or proposed. A device popular with some designers is to draw the landing wheels up within the streamline body after launching. This was proposed by Mattullath in 1899 and favored by Gallaudet in his recent designs. Another device, described in Mattullath's patent specifications, and now strongly advocated by Vedrines, is to change the camber, or fore-and-aft curvature, of the wings during flight. With sufficient propeller thrust the machine could thus be supported at slow speed along the ground, without lowering its tail too near the surface, by simply increasing its wing curvature, and once well afloat, could be greatly accelerated by flattening its wings and diminishing their resistance.

A practicable device for altering the propeller pitch would also be serviceable, since in a high-speed aero the pitch now employed is very steep. In the winning monoplane, for example, the screw used during the race was 3.15 meters (10.33 ft.) in pitch by 2.35 meters (7.7 ft.) in diameter. If at slow flight along the ground the pitch of the screw could be diminished and the speed of rotation increased, a greater thrust could be had for the same engine power.

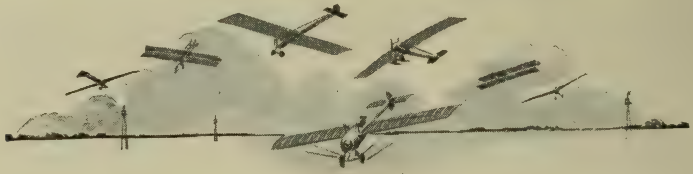
Assuming that the present control mechanism is amply safe and effective for racing; also that launching and

Vedrines Turning at 100 Miles an Hour. The Photographer on the Pylon Found It Extremely Difficult to Snap His Shutter Before Vedrines Had Passed Him

landing of fast aeroplanes at moderate speed can be achieved by methods now in contemplation, the important task remaining is to diminish the aggregate resistance of the machine and to increase the screw thrust. Here, no doubt, very material improvement can be effected. The present monoplane body has an excessively blunt prow. The form of least resistance at racing speeds has never been determined, either for a freely moving projectile, or for a torpedo-shaped hull propelled by a coaxial screw. Nor is the most efficient form of propeller for such speeds known, either from theory or experiment. In order to perfect these features in a systematic engineering way, it seems desirable to measure in actual flight the pressure distribution all over the aeroplane and its propeller. Such measurements are of value to the entire art of aviation. Hence they should be performed in a national or an endowed aerotechnical institute, by specialists having proper facilities; and the results should be made available to all persons interested in the art.

No practical plan for radically increasing the relative power and lightness of the engine seems to be available at present; but if its head resistance could be properly reduced, a material gain of speed would follow. It has been proposed to use a parabolic windshield before the propeller and engine, instead of the spherical cap used on Vedrines' machine, the spherical cap being apparently too flat. An engine of less cross section for the same power has also been proposed. The Gnome engine on Vedrines' racer presented a much larger front than the cross section of the body neighboring the cockpit. A plan of long standing, devised to remedy this defect, is to employ an elongated water-cooled engine, entirely inclosed in a hull of minimum resistance, just large enough to accommodate the pilot, and having radiator surfaces smoothly arranged along its sides. This plan was proposed by the present writer in 1899 for Mattullath's aeroplane, and subsequently was used on the Antoinette monoplane.

These manifold considerations show the importance of live teamwork in any community aspiring to international excellence in aviation. If America is to regain her leadership, the zeal and powers of all her aviationists must have systematic direction and effective exercise. There are patriotic sportsmen, capitalists and congressmen who would gladly assist in securing sufficient funds; there are capable designers and constructors who, with adequate funds, could produce aeroplanes superior to any in the world; there are men skilled in aerodynamics and engineering who could supply all the physical data and principles required in such advanced construction. It is time to coördinate these competent and willing agencies in the interest of a noble science, sport and industry so largely of American origin and so fruitful in American renown.



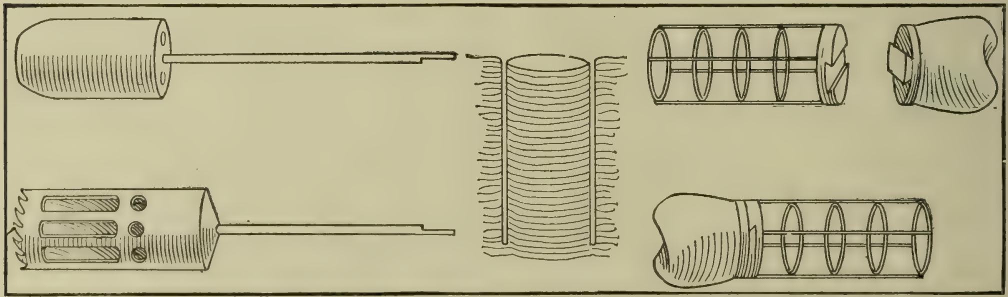
ARTIFICIAL ROOTS FOR FALSE TEETH

To complete false teeth, a dentist of Wichita, Kan., has invented an artificial root, by means of which an entire new set of sound teeth can be placed in a jaw from which all the natural teeth and roots have been removed. To prove that his invention is of practical value, he recently took with him to the convention of the National Dental Association in Washington, a Wichita attorney, who has a number of these artificial roots in his jaws.

Two hollow, cylindrical instruments, one chisel-edged and the other with a saw-tooth edge, are used to make a hole, respectively, in the gum and in the bony tissue in which the roots grow. Into this hole a cratelike framework of platinum is fitted. The tissue grows through the interstices of the framework, and six weeks after the operation the metal root is firmly fastened, practically a part of the jaw.

On top of the latticed cylinder, forming the root, is a metal disk having a slot, into which another disk is fitted; and upon this latter an artificial tooth or bridge is built up in the ordinary way. When a whole jaw is to be fitted with teeth, about six roots are set and the space between them is bridged.

The platinum root is impervious to acids and does not injure the tissue which grows about it. The exhibition of the artificial root excited much interest among dentists from all parts of the country.



Above: Tool for Cutting Out Gum

Below: Saw for Cutting Cylindrical Slot in Jaw Bone

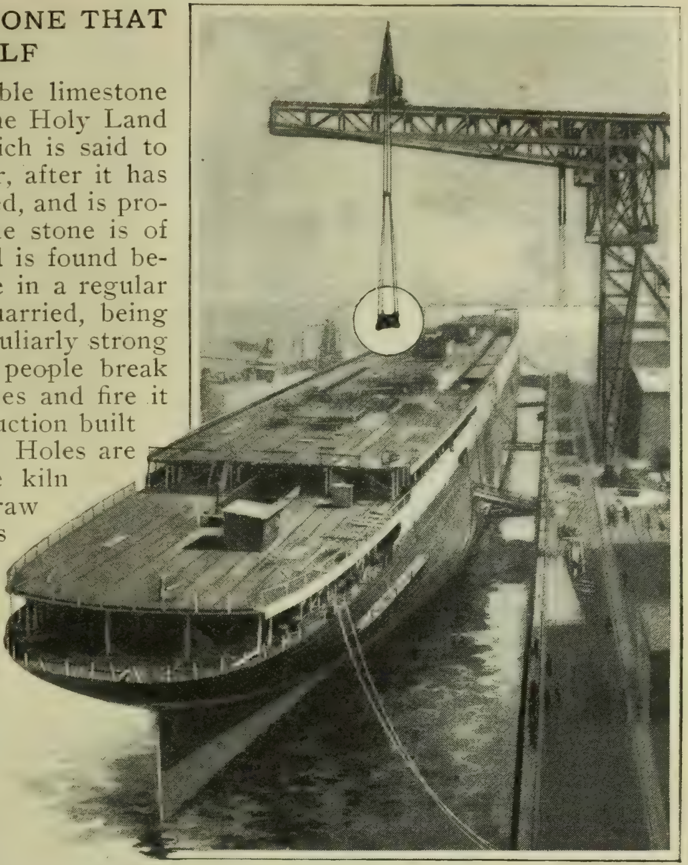
Cross Section of Jaw Bone Shows Slot Cut for Root

Above: Wire Root Ready for Placing in Jaw Bone

Below: Artificial Tooth Attached to Artificial Root

HOLY-LAND LIMESTONE THAT BURNS ITSELF

A species of combustible limestone has been discovered in the Holy Land by a recent traveler, which is said to make an excellent plaster, after it has been burned and air-slaked, and is produced very cheaply. The stone is of a grayish-black color and is found between ordinary limestone in a regular stratum. It is easily quarried, being rather soft, and has a peculiarly strong odor of kerosene. The people break the stone into small pieces and fire it in a kiln of rough construction built of stones against a wall. Holes are left in the sides of the kiln through which tufts of straw are stuck. These tufts are lighted with flint and steel and the lime ignites and burns itself. It requires 12 hr. to burn a kiln and then it is found that all of the rock, except that at the top and some around the sides, has been thoroughly burned. The lime produced is of a good white color. It burns with a black smoke and an odor similar to that of petroleum. When cool, it is air-slaked and screened. The self-burning quality is accounted for by the supposition that the limestone has become impregnated with petroleum in the earth.



The Giant "Imperator" after a Test of Her Watertight Bulkheads. The 220-Ton Crane is Just Lifting Two Large Fire Engines Ashore

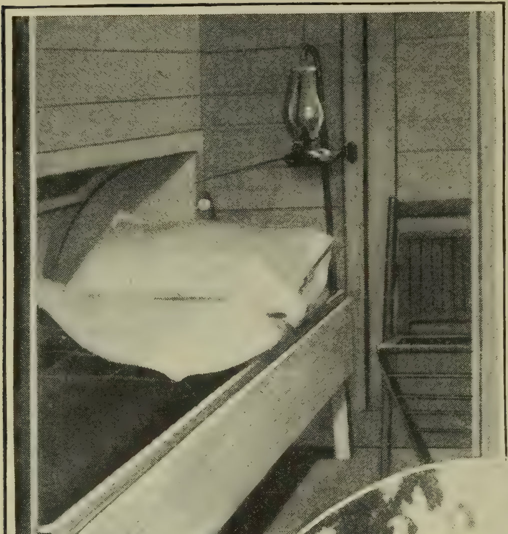
TESTING THE "IMPERATOR'S" WATERTIGHT BULKHEADS

The object hanging from the crane in the accompanying illustration of the world's largest steamship, the German "Imperator," consists of two fire engines belonging to the Hamburg fire department. The size of the giant liner and of the 220-ton crane may be judged by the fact that these engines, which appear so small in comparison, are the largest fire engines of their type on the European continent.

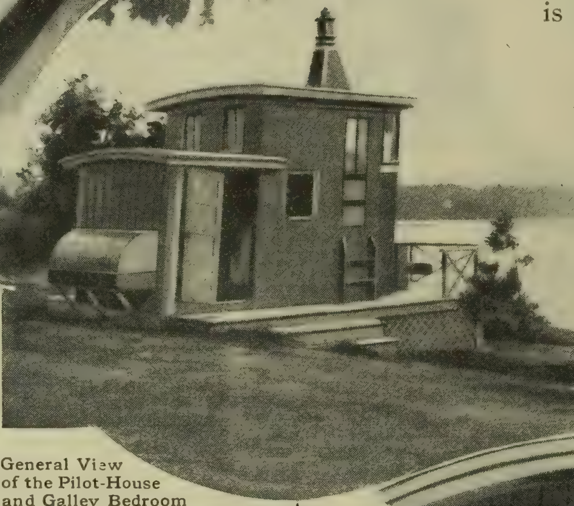
The fire engines were put aboard the "Imperator" when she recently underwent a test of the strength of her watertight bulkheads, in which one of the compartments was pumped entirely full of water by the fire engines.

AN INSIDE-OUTSIDE BED IN ANCHORED PILOT HOUSE

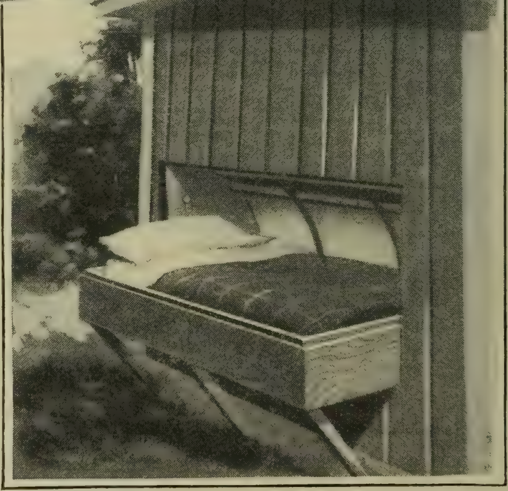
An interesting setting for the inside-outside couch-bed idea for bungalows, illustrated some months ago in this magazine, is shown in the accompanying illustrations. Recently, I. H. Spiers, of North Edgecomb, Maine, purchased the hull of an old tug that lay stranded on the bank of the Sheep-



The Bed is within the Room When the Revolving Top is Swung Down on the Outside



General View of the Pilot-House and Galley Bedroom with the Revolving Bed Top Down on the Outside



Lower View Shows the Revolving Top Swung Down on the Inside, Leaving the Bed in the Open Air

scot River, opposite his home; cut out the pilot house and galley, transplanted them to his own grounds and set them up as shown. The pilot house makes a fine den or study, and the galley a cozy bedroom.

Then he cut out a portion, 6 by 4 ft., of the back wall of the galley, and centered a bed, half in and half out, in the opening. Over the bed he suspended a revolving top, in section a quadrant. When this top is revolved to the outside position, the bed is practically inside the room, and, when revolved to the inside position, the bed is outdoors. A neighboring blacksmith supplied the wheel rim out of which the frame of the revolving top was mainly constructed, and a sheet of galvanized iron was used for the covering. Heavy sash weights, swung so as to counterbalance the revolving top, whether inside or outside, make the shifting easy. Should it start to rain when the bed is outdoors, all the occupant has to do is to raise his hand and swing the top from the inside to the outside, and he is within the room.

The illustration, in which the bed is seen inside the room, also shows the way in which the lamp is extinguished when the occupant of the bed has finished reading and is ready to go to sleep. A rubber tube, is provided so that the light may be extinguished from the bed.

COMMENT AND REVIEW

Electioneering in Airships

OUR British friends across the sea are quite as active and original in their methods of getting after the elusive voter, as any Yankee politician. Not so long ago one of the closely contested districts was visited by flood which turned the streets of several small towns into canals. In order that the good work should not suffer, the candidates procured small boats and continued the house-to-house canvass in that manner. The scheme has certain advantages, one of which is that the speaker can "stand by"—to use the nautical term—and the marooned voter, having no easy means of escape, must listen to the campaign speech whether he likes it or not.

The latest feat in electioneering is the employment of an aeroplane which was used to distribute campaign literature over the suburbs of Edinburgh, in the interest of Major Hope, who has no objection to being re-elected. A generous advertising of the stunt created general curiosity to get one of the speeches from the air and doubtless insured a careful reading. This method literally deserves the title of a "whirlwind campaign" such as formerly raged in this country.

* * *

Chinese Poor Soldiers

THE Chinaman is a poor soldier: Not that he is lacking in courage, for on occasion he cheerfully sells himself as substitute and goes willingly to the executioner's ax in order to provide his parents with the small sum necessary to support them through life. The strength of an army is in teamwork, and here is where he fails on account of his aversion to being ordered. This is found in his domestic and industrial work. A general line of policy or desired results can be laid down, and he will faithfully work in accordance therewith, but he dislikes to be followed up through the details of the work with frequent orders. He will produce excellent results—but they must be accomplished in his own way. Hence the essence of good militarism—prompt and unquestioned obedience—comes in direct conflict with his nature, and makes him a poor soldier. However, this trait is not entirely wanting in other nationalities, as every business man knows to his sorrow, and the difficulty of getting employes to do a thing in the prescribed way is one of the constant anxieties.

* * *

A Strap-Iron Story

A CHICAGO manufacturer had occasion to make a large export shipment. There were many boxes filled with heavy goods. The freight item alone was a large one. One of the conditions was that the boxes should be secured with bands of strap iron of a certain width. This was the first order from a big concern, and had been secured only after great effort. If satisfactory, large future orders were assured. Everything depended on getting started right. So, extra care was to be taken in making and finishing the goods, and special packing boxes of extra quality and strength were ordered. The goods and boxes went to the packing room with careful instructions, including the width of the strap iron, which was a quarter of an inch wider than had been ordinarily used in domestic shipments. The packing clerks did everything as ordered until they came to the very last item—putting on the strap iron. There was none of that size in the house; the ordinary straps were more than strong enough; then why bother to send out and get the larger size? So the entire shipment went on its way bound with the narrow strap iron.

Three months passed before the firm heard from their shipment, and what they heard caused dismay. "Goods returned—not shipped as instructed."

In due time the shipment landed back in the shipping room. The boxes and contents had endured the long railroad hauls and two voyages without the slightest injury. Nothing seemed to be wrong; apparently everything was in perfect condition. Months later when letters had passed between two continents it appeared the shipment was rejected on account of the narrow strap iron. Seems absurd, does it not? Yet, the buyers reasoned, if their instructions had not been followed in one detail, doubtless the same was true all the way through, and they would not even open the boxes.

Fidelity in little things makes great accomplishments possible.

Revival of the Bicycle

THE recent maneuvers of the British army, conducted on a larger scale than ever before in times of peace, has brought the bicycle into favorable notice, and the probability is that vehicle will be given an important standing. With good roads, such as are found throughout England, the bicycle has demonstrated its reliability and utility. Some 3,500 of these cyclists were attached to the cavalry and the rapid movement of that large body was surprising to most people. It is conceded that the bicycle would be no substitute for horses in a battle charge, though the destruction possible with two or three thousand motorcycles at full speed would certainly cause some confusion, especially if the riders were protected with steel shields. The direction of a cycle command would require specially trained officers; in fact, the French have had the subject under consideration for some time. A combination of motorcycles and bicycles will not unlikely be the final outcome, for one motorcycle can tow four or five mounted bicycles over ordinarily good and level roads at a speed of 15 to 20 miles an hour. For distances of, say, up to 30 miles, a motor-bicycle regiment could be transferred to emergency points in far less time than by railway, even assuming that the railway were convenient for loading and unloading.

A Moving-Picture Story

WITH our daily press and magazines filled with recitals of shortcomings of trusted individuals, of obligations forgotten in the mad rush for money, it is positively refreshing to flash upon the curtain of events even an occasional incident where gratitude stands supreme. Really the world is not nearly so bad as represented, for it seems to be a perverse element of human nature to magnify the wrong and minimize the good. Here is a true story which came to me unknown to the principal; in fact, I took no chances on asking his permission to print it, fearing he might refuse.

Some years ago a young man with more ambition than money went west in search of fortune. Through no fault of his he finally found himself far out on the plains without friends or money. He was fighting his way across the Rocky Mountains, walking by day and catching what free rides he could on the night freight trains. At last he found himself at a water tank, miles from any habitation, thinly clad, penniless, weak from hunger and exhaustion. Life seemed a failure and not worth the battle.

A freight stopped for water, and the engineer seeing his pitiable condition told him to climb into the cab. The dinner pail was brought out and one of the two had a hearty meal. At the end of the run the young man was awakened and found himself literally over the mountain, in a land of sunshine and plenty. With tears of gratitude he told the engineer he would never forget him.

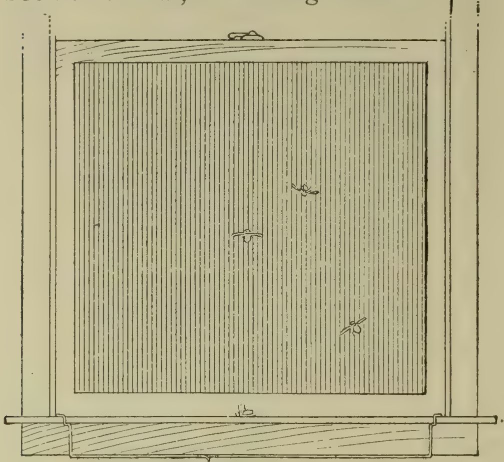
Ten years passed and both fame and fortune had smiled on the chance passenger. He had foreseen the possibilities of a vast business, then new, but now found in every city and town. He had made inventions and improvements which contributed largely to its development and success. He was worth his millions; his name was known throughout the world wherever moving pictures flash. One day in taking a short cut through the park he hurriedly passed a most wretched-looking man, ragged and thin, who was sitting on a bench with bowed head, a picture of despair. Bankers and capitalists were even then waiting to hold an important director's meeting, and time was precious. But something in the unfortunate seemed to specially call for sympathy, and retracing his steps he stood before the bench. He spoke to the man, who had been a locomotive engineer in Mexico, was doing well, ran over a native, had to flee the country; been unable to secure a run on reaching his own land and was now at the end of his resources.

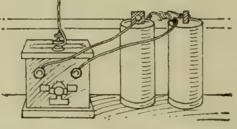
Yes, he proved to be the same engineer and his former passenger "made good." He dressed him and gave him money; he rented a place of amusement and set him up with the finest moving-picture establishment in the city, where he prospered, and now owns fifteen "movies" and is worth a million dollars. The story would make a good subject for a film.

Not every kind act can turn out as profitably as this did, yet every kind act brings its own reward in the doing.

H. H. WINDSOR

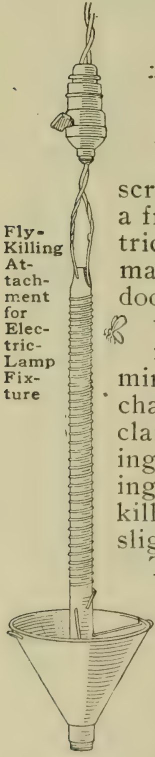
ELECTRIC DEVICES FOR KILLING INSECTS





A Wire Screen Electrically Charged for the Extermination of Flies and Other Insects

Two unusually interesting devices, both electrical, for killing flies and other insects, were developed during the "swat-the-fly" campaign of last summer. One of them is a screen or grid consisting of a frame wired with fine, electrically charged wires. It may be used in windows or doors in place of the ordinary wire netting, or in a modified form, for the extermination of insects in orchards and gardens. It is claimed that all insects alighting upon the wires or attempting to fly through, will be killed by a shock which is too slight to harm a child.



Fly-Killing Attachment for Electric-Lamp Fixture

The other device is a wire-wound rod designed to be suspended from an ordinary electric-lamp fixture. Molasses may be used to draw the flies, which are electrocuted when they touch the wires, and drop into a receptacle.

SUBMARINE DOWN FOR 24 HOURS

A record of 24 hours under water has already been made by a submarine boat of the Italian navy, in the course of experiments to determine how long a submarine can stay down. The study is to be continued so long as there seems to be any possibility with present devices or suggested improvements to make the time longer. Some months ago one submarine, the "Glauco," made a record of 22 hours. The 24-hour record was made by the "Squalo," at Venice. Her crew consisted of 20 men, including the commander and a doctor who made notes of the effect of the submersion on the men. When the boat came to the surface, the doctor reported all of the crew to be in normal physical condition.

CONCRETE SYSTEM LIKE SHEET PILING

A system of interlocking concrete piles that is much the same as sheet piling but is said to possess much greater strength, has been tested with satisfactory results in England. In this system reinforced concrete slabs are first placed between the locations for the circular piles. The slabs have overlapping or interlocking lugs which form a tongue-and-groove connection and are set one above the other, the interlocking joints having circular holes for the admission of the piles. After the slabs have been placed, the pile can be passed through these holes and driven to a firm bearing, thus anchoring the slabs. This system is said to be particularly effective for breakwaters and protective works for canals and rivers.

¶All of the new buildings in the course of construction at the Angel Island, California, military post, are being constructed of reinforced concrete, and as the entire post is to be rebuilt, it will mean that a complete military settlement of concrete buildings will soon be in existence.

THE WASTE IN THE COAL INDUSTRY

In taking 500,000,000 tons of coal out of the mines in this country during 1911, no less than 250,000,000 additional tons were wasted, being left underground in such condition that it probably will not be recovered in the future. A quantity of natural gas larger than the total output of artificial gas during the same period in all the cities and towns of the United States was also wasted by being turned loose into the atmosphere.

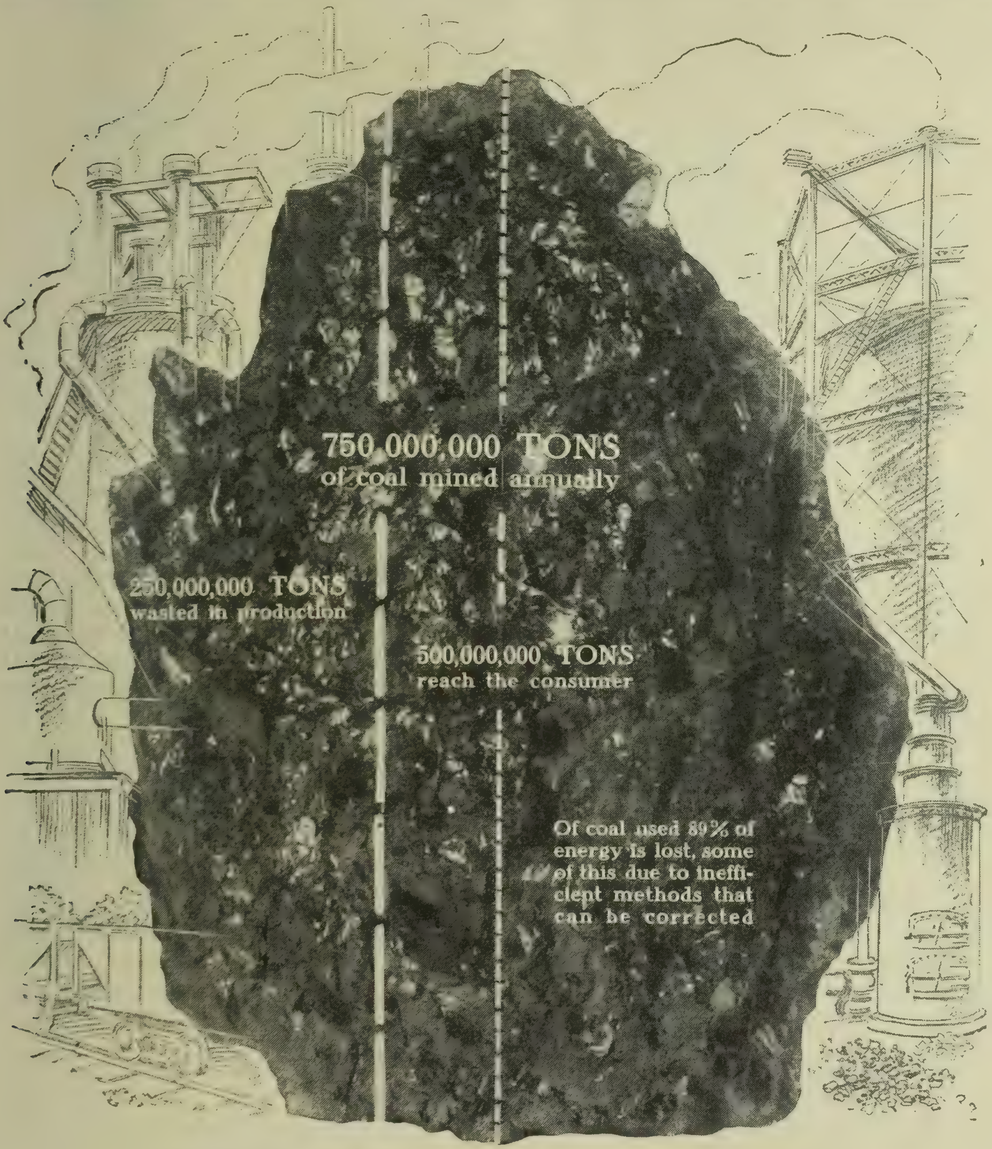


Diagram Showing the Coal Losses in the United States Estimated by the United States Bureau of Mines

The wastes of carbon in the modern economy of this country are almost incomprehensible. Very likely one-third the bituminous and one-half the anthracite coal are left in the mines; and the loss by no means ceases after the coal is mined, for probably not more than 11 per cent of the energy in coal is being effectively utilized, the remainder being lost through the inefficiency of the steam boiler, the steam engine, and the electric dynamo. It is estimated that the boiler scale in locomotives alone in this country means a loss of over 15,000,000 tons of coal annually. In making coke by the old-fashioned process, the waste amounted to $40,000,000 in the United States last year, and almost inestimable losses of valuable substances, such as sulphur, arsenic and bismuth, are also taking place in the escape of the flue gases and in the flue dust.

SUSPENDED MONORAIL SYSTEM SUGGESTED FOR CHICAGO

The success of the overhead monorail system in the German cities of Elberfeld, Barmen, Vahwinkel, and at Loschwitz, near Dresden, Saxony; and the fact that after due study and consideration, Hamburg is at present building just such a rapid transportation system, has caused J. R. Rauhut, a Chicago engineer, to propose this system for Chicago's consideration.

Photographs of the Elberfeld line, plans and specifications of a similar line proposed for Berlin, and other data appertaining to the overhead monorail system were placed before the Chicago engineers recently, at the City Club of Chicago, where an exhibition and discussion on Chicago's transportation problem was in progress.

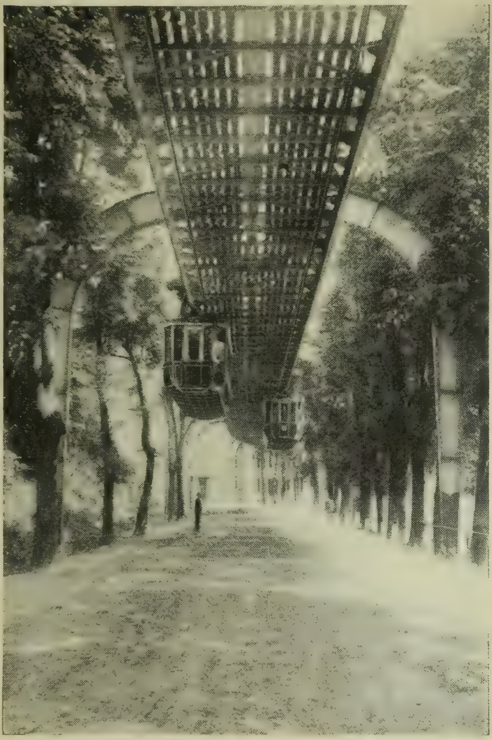
The idea is to adapt the overhead or suspended monorail system as a combination elevated and subway system for Chicago, the system being operated as a subway in what is known as the downtown or central district, comprising an area about 1½ miles wide and 2½ miles long. Outside of this area, on the north, west and south, the system would be operated as an elevated road, like that proposed for Berlin. As there would be no tracks on the floors of the subway, the space beneath the trains could be used for sewer, water and gas pipes, electric light, telephone and telegraph wires, etc., all of which would be accessible at all times, for repairs or inspection, without any interruption of the train service.

The subway commission of the Chicago Common Council favor high-level tunnels wide enough, in certain districts, for four tracks, ventilated according to the latest New York practice, and extending from the center of the downtown district about 5 miles west, 10 miles south, and to a considerable distance north, totaling about 56 miles. They believe, according to latest reports, that all public utilities, except transportation, should be excluded from these tunnels, and would make no provision for gas, water, sewers, electric power, or telephone wires. The financial question involved is the subject of more difference of opinion than any other. Approximately $130,000,000 would be required, and some members of the committee favor a less extensive system at first, which would comprise the line of subways in the business area only, fed by the elevated and surface lines, which would be stopped outside this area.

As compared with the amount required for the committee-proposed subways, about $100,000,000, Mr. Rauhut states, would build and equip 12 miles of double-track suspended monorail subways in the business area, and 140 miles of elevated double-track monorail running in and out of all parts of the outer area.

The monorail system in the subways would, it is claimed, do away almost entirely with the shaking of foundations and buildings, owing to the fact that the cars would run suspended from only one rail. The second rail of the ordinary railway system is in itself a source of irregularities in the motion of a train through the inequality of position and inclination.

As far as the elevated-railway portion of the system is concerned, the supporting structure of the suspended monorail can be designed much lighter than for the ordinary elevated road, and this lighter construction and its higher position is much less obstructive to light and air than a heavy track surface, from 22 to 35 ft. wide and nearer the level of the street. This is apparent in the illustration of the German monorail line. The much narrower gangway of the construction needs no solid boarding, but can even be formed of iron-framed glass paving.



The Elberfeld Line Running Through a Park at Sonnborn

It is claimed that the power consumption of the suspended monorail system is less, by 20 to 30 per cent, than that of the ordinary two-rail system of the same capacity. The Barmen-Elberfeld line, with its expensive foundations cost but $275,000 per mile to build. Trains consisting of four cars run on this line.

The cars of the aerial monorail system are suspended from a single rail by means of strong hook-shaped hangers attached to wheels which run upon the rail. The cars are fully protected, under all conditions, from falling to the ground. The regulation of distances between trains is controlled by an automatic electric-signal system, a red light, visible to the motorman by day or night, blocking the line and preventing a train from leaving any station until after the preceding train has left the next.

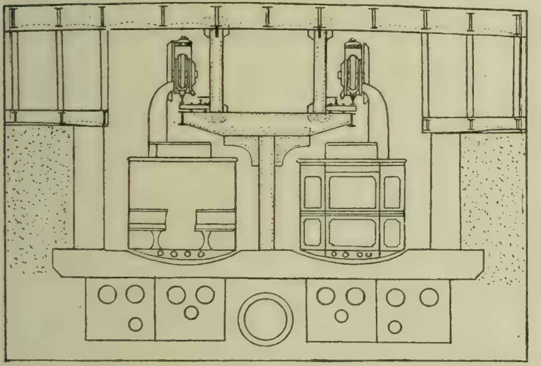
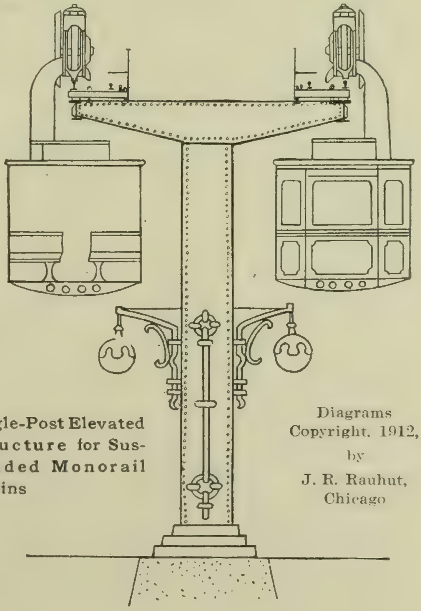


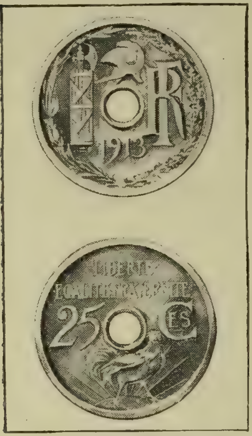
Diagram Showing Suspended Monorail System Operating in Subway. Also Public-Utility Galleries



Single-Post Elevated Structure for Suspended Monorail Trains

Diagrams Copyright, 1912, by J. R. Rauhut, Chicago

FRENCH COINS TO HAVE HOLE IN CENTER



Courtesy L'Illustration

After investigations covering a period of three years, the French government has finally come to the conclusion that nickel is the only suitable metal for the new coins, of small denominations, which it is proposed to issue, the numerous aluminum bronzes first tried having been found too hard and brittle. As for the design of the coins, which will be of nearly the same size and in three denominations, corresponding to 5, 2 and 1 cents in United States money, several are submitted. It is practically assured that they will have smooth edges, and that the ancient Greek form with round perforations in the center will be adopted. The issuing of the new coins, which are expected to be put into circulation next year, will mean a saving to the government of over $500,000.

GYROSCOPIC ACTION OF ROTARY MOTORS

Increasing attention is being given by aviation engineers in America and abroad to the question of how much dangerous gyroscopic force is exerted by rotary motors on aeroplanes. Two years ago, the theory that this force was the cause of accidents was being urged by Thomas Preston Brooke, of Chicago, and was considered in these pages. The controversy now is not whether the gyroscopic force, undoubtedly created by a rotary engine, really affects the flight of an aeroplane, or not, but to what degree. A German engineer, Von Muffling, has recently contended in British aviation papers that the gyroscopic force is responsible for the breaking up of aeroplane wings reported in a number of accidents. M. Bouchard Praceig, of the Society of Engineers of Paris, this last summer made public calculations purposing to prove that the gyroscopic force increased according to the square of the speed at which a turn was made by an aeroplane. The manufacturers of the Gnome rotary motor acknowledge that a gyroscopic effect exists, but contend that experiments which they have conducted do not justify the belief that the force is strong enough to interfere with the easy control of an aeroplane by the operator. A 50-hp. Gnome motor, running at 1,200 revolutions per minute, was mounted on a platform and the platform turned. The experiment showed that when the platform made turns in 24 and in 12 sec., respectively, the gyroscopic force was balanced by weights of 23.3 and 57.6 lb. at a point 39 in. from the axis of the motor. In answer to this report, the supporters of the theory that this force is dangerous, contend that aeroplane turns are made much quicker than this, and that, consequently, the gyroscopic force exerted is very great. Mr. Brooke believes that the Quimby and the Peck accidents, as well as many others, were due to gyroscopic force preventing the airmen from making the turns and dips they attempted, and he points out, in the reports of these accidents, notice of a turn to the left, just as the trouble began, as demonstrating gyroscopic force in an engine which revolves clockwise. There are, however, many airmen and engineers who are declaring that the force is no greater and no more dangerous than the manufacturers assert. On their side it is pointed out that Vedrines, making sharp turns at more than 100 miles an hour, had no trouble with this force.

¶A new baking powder is being prepared from maple-sugar "sand," a waste product in the production of maple syrup hitherto thrown away as valueless.

MOTORBOATING IN WINTER

By GEORGE FITCH

THOSE mere onlookers who have imagined that the semidivine sport of motorboating ends when the snow piles up and the water becomes hard on top have another guess coming.

Fascinating as the game is in summer it is even more absorbing in winter. In fact it is hard to tell whether motorboating is primarily a summer or a winter sport. It is a better and more exciting diversion in summer, but it is only after December that the true crank can begin really to live with his boat and to carry her with him through all his waking hours.

This adaptability—I might say amphibiousness—of the motorboat is one of its greatest virtues. An automobile is a delight in dry weather on land. But in a rainstorm or a river it is a poor dead thing. An aeroplane in the sky is an inspiration, but an aeroplane in a truck garden is of interest only to the machinist or the coroner. But the motorboat, originally designed to inhabit the water, is just as enjoyable, and even more at home in a backyard or a barn, and can hold the love of its owner and absorb his spare moments as thoroughly when it is on wheels as when it is floating in a clear deep channel with full gasoline tank and the engine in the best of humors.

"Hauling-out time" in the fall is a season of regret only to the casual navigator who pays a dock tender to keep his boat in condition, and who arms himself with a basket of lunch instead of a hip-pocketful of tools when he sets out for a run. The lunch-basket skipper runs the rivers until late in September and then says good-bye to his boat and leaves orders with the drayman to haul her out and store her. The streets of a river town are congested with motorboats in the early fall. They poke along painfully on wheels, colliding with telephone poles, going aground on curbs, capsizing on crowded corners, and exhibiting all of their natural tendencies in a public and shameless fashion. By November most of them are safely housed for the winter, and their owners have taken up pool or bowling or German in 25 lessons, and have forgotten all about them.

But the real, all-year-round boats still remain in the water. It is as hard for the chronic gasoline inhaler to get his boat out of the river as it is for a small boy to extract himself from the same river on a July day and dress for dinner. The motorboat slave takes a last ride late in November, and then another last ride; and then as the December wind whips down with a flurry of snow, and the chilled water grows dark and forbidding, he puts on two sweaters and mittens, starts his engine with a mighty effort and makes one final, positively farewell appearance—after which he chops his boat out of the thin ice the next morning, loads her onto wheels and steers her gleefully up the street to his backyard to begin the winter season.

The backyard tells the story again. There are boat owners who are content to store their boats in regular warehouses and to turn over the job of painting and renovating them to a professional. Others haul their boats out on the bank, cover them with canvas, and buy new carburetors, coils and brass parts in the spring when the river thieves have gotten through their work. Still others hunt a rapid place in the river which will not freeze and leave their faithful servants moored dismally in the open. But the real crank doesn't leave his boat at all when winter comes. He takes her with him. If he has a good barn, he knocks out an end and wedges the craft inside, even if he has to sell the horse to make room. If he hasn't a barn, he builds up a block foundation and puts the boat in the backyard where he can steal out of an evening with a lantern and commune with her through the medium of a saw, a wrench and a paintbrush. I have even known the proprietor of a cabin cruiser to run a pipe from his furnace room into his boat and put in a steam coil so that he could work on her with perfect comfort all winter.

"Winter passes happily for the enthusiast. Even more happily for his wife, who can sit with him as he works, thus sharing him with the boat"

There is no such thing as a perfect boat for the crank. He runs his craft in the summer only to discover what ought to be done to her in the winter. You can detect the casual motorboatist in summer by the content and pleasure with which he runs an engine which limps, stutters, backfires and swoons away on the least provocation. On the other hand you can tell the crank by the dissatisfaction and annoyance with which he runs an engine which purrs like a sewing machine, and by his habit of stopping in midstream with everything in seemingly perfect condition, and dissecting the carburetor in an effort to get four more turns per minute out of his propeller. In like manner the dilettant hauls out a decrepit and sullen boat in the fall and stores her away perfectly satisfied, while the enthusiast hauls his perfect craft home and immediately makes preparations to take down the engine, repack the bearings, rewind the coils, try four new carburetors, change the shaft angle, put ball bearings in the thrust block, relocate the gasoline tank, improve the oiling system, put speed paint on the bottom, experiment with the timing mechanism, install a patent bailer, and wallow, generally, in mechanical pleasures.

Thus the winter passes happily for the enthusiast, and even more happily for his wife who can steal out into the barn and sit with him while he works, thus sharing him with the boat. Winter is a great relief for the motorboat widows. They get acquainted with their husbands again, and in their gentle ways try to woo them away from their mad infatuations—though when a man is in his grease cups woman has little influence over him.

"I have lingered an hour to listen to boat owners racing them in January around a steam radiator."

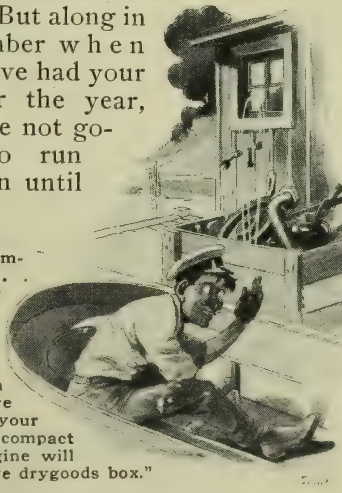
When the crank isn't busy rebuilding his boat during the winter, he is racing it with some other crank. Most of the racing is done in the winter as a matter of fact. It is the ideal season for speed. After December eight-mile-an-hour boats begin to develop tremendous horsepower and to run all day at twelve miles an hour with only two small cylinders—while 12-mile boats become demonlike in their violence and tear across the map at unheard-of speeds. I would not go four feet in summer to witness a race between two fat-waisted, snub-nosed boats carrying eight horsepower apiece—spavined horses at that. It is about as exciting a sight as a race between an ice house and a whistling post. But many a time I have lingered for an hour to listen to the owners of these same boats racing them in January around a steam radiator in a downtown office. It is one of the most thrilling forms of sport and at times is positively dangerous if either of the owners is quick-tempered.

"Run your boat until the first of October. Then pour hot water on your carburetor and run until you break down."

But I began this article in the interests of the casual devotee, and I have almost entirely ignored him. The wild-eyed fan needs no advice or suggestions. He is sufficient to himself. It is the gentle skipper who loves but fears his engine, and who deprives himself of all aquatic bliss during the winter, who has my sympathy, and for whom I wish to write a few lines of advice regarding the storing and wintering of motorboats.

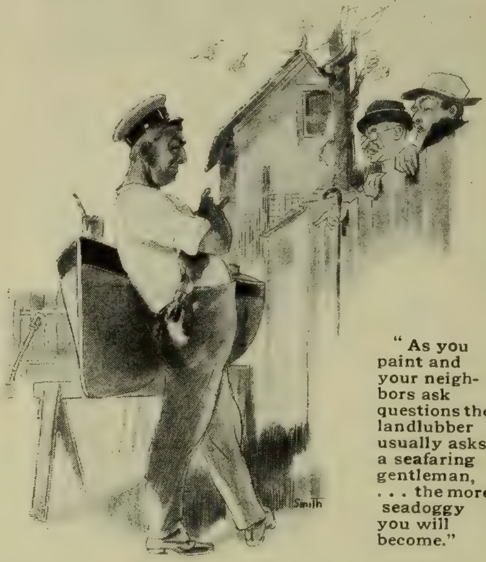
In the first place, do not haul your boat out when the first cold day comes. You will miss all the glories of October and the clear, crisp delights of a perfect November day when the woods on either side of the river are masterpieces in yellows and reds. Run your boat until the first of October. Then put in a spirit lamp and a teakettle, pour hot water on your carburetor when your engine declines to start, and run until you break down. A permanently disabled boat is the only kind which should be hauled out before the ice comes. With ordinary amateur luck you should be able to run until some time in November.

When your engine has given its final croak and must be thoroughly overhauled before it will run again, haul the boat up to the dock and take the thing apart yourself. This is a glorious opportunity for you. No amateur should take his engine apart during the season. It is a waste of time, and, generally, a waste of parts. But along in November when you have had your fill for the year, and are not going to run again until spring anyway, get a large box and an assortment of wrenches, and put in a couple of enjoyable days reducing your



"In November . . . unscrew everything that will unscrew, and when you have finished, your neat and compact little engine will fill a large drygoods box."

engine to fragments. Throw away caution and abandon yourself to pleasure. Unjoint the water connections, dissect out the crankshaft, extract the spark plugs, amputate the flywheel, desiccate the carburetor, sever the shaft at the coupling, disembowel the cylinders, and yank the crankcase from its bed. Unscrew everything that will unscrew, without fear or favor, only remembering to put all the fragments you produce in the large box. When you have finished, your engine, which was formerly a neat and compact little affair, will fill a large drygoods box, and it would take you four months and seven days, at the least, to get the thing together again. But that is the least of your worries. In the winter, take the box down to an expert and have him repair the engine. He would take it all apart anyway, at 80 cents an hour, and you will have saved a large sum of money and gotten a lot of amusement by doing it for him.



"As you paint and your neighbors ask questions the landlubber usually asks a seafaring gentleman, . . . the more seadoggy you will become."

When you have finished your orgy with the engine, borrow a compass, hire a competent drayman, and navigate your boat into your backyard. In the spring, get a gallon of paint, an acre of sandpaper, and a suit of overalls and jumpers, and get to work. Go over the entire hull, inch by inch, removing the old paint with the sandpaper, and then removing the sandpaper from your eyes as you writhe around on your back beneath the keel. Reduce the surface to a smooth and polished state, and then paint. As you paint, and your neighbors lean over the fence and ask the timid sort of questions which the landlubber usually asks of the seafaring gentleman, you will begin to feel competence and experience swelling within you. The more you paint and the more questions you answer, the more seadoggy you will become—until by the time the hull is ready for the water, you will be entirely mistrustful of the expert who is enriching himself on your engine, and you will go down to his shop and work with him, getting in the way of three men at once, and stuffing yourself with engine lore and mechanical enthusiasm. When you have launched your boat, you will do it as its master, and you will jerk over the flywheel with the impatient air of a man who knew flywheels when they were no bigger than buttons, and who doesn't intend to take any sass from them.

A great many motorboat owners enjoy themselves in an unbusinesslike fashion, and rely simply on memory to preserve their experiences for them. This is a great waste of good pleasure. Every boat owner should keep a log in which he should set down the details of every trip, including speed, cost, accidents, incidents and conversation. This log can be transcribed in the winter to a record book well illustrated with kodak pictures and postal cards, and the book will be a permanent memory of joys and troubles which will serve to make the winter endurable even after you have become the most unreasonable crank. I have just been completing my book for the year to date, and turning over the leaves at random, I find the following entries:

May 28. Launched boat, foot of Green Street. Waterline correct. This sticks

Wright for a dinner. He bet I would have to slant the river up forty feet to make my waterline consistent. Started engine in half an hour. Pump didn't work. Discovered fact by putting hand on the cylinder. Will be able to use hand again in a week or two. Dissected pump. Men who would invent pump like ours should be made to eat it. Got to dock at 7 p. m. Distance one mile. Time, 2 hr. 30 min. Seven fellows offered to tow us, but we are not running a barge.

June 7. Mossville and return in evening. Pilot, Doc. Wright. Engineer, myself. Four passengers. Warm and rough. Coils quit and let us wallow ten minutes. Would like to interview varlet who invented coils. Raced four miles with Allen's "Pup" on way home and gained 150 ft. on her. Allen says he was running on one cylinder. Asked him if he used the other to keep his smoking tobacco in. Made him mad and he promised to get us in the Henry race. Small chance.

June 11. Went without breakfast and ran all the way to the dock in order to leave for Hennepin by 8 a. m. Wright and Green were 5 minutes late. Made remarks about it. Got away at 1 p. m., owing to balky setscrew. Man who invented setscrew is a curse to humanity. Doc. Wright, engineer. Myself, pilot. Green, cook, porter, electrician, carpenter and deck hand. Weather hot, water smooth, gasoline poor, engine peevish. Stopped at Spring Bay and let Green take it apart. Never again. He wanted to take it to bed with him. Andrews came by with the "Stuttering Sue" and wanted to tow us. Told him the "Bess" couldn't tow a wake. Says he will meet us in the Henry race. Made Henry at 8 p. m., Hennepin 10:30. Woke up whole town hammering on hotel door. Distance 48 miles, time 9 hr. 30 min. Gasoline, 12 gallons; oil, 1 quart. Sandwiches, 78.

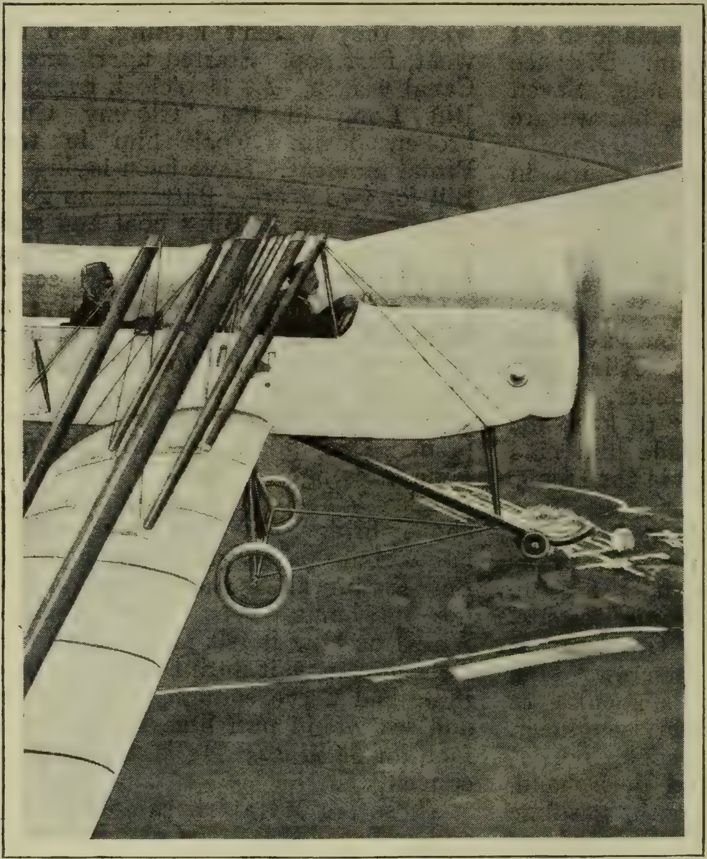
June 12. Cold and rainy. Green and Wright couldn't start engine. Let them try half an hour, then slipped toothpick out from under vibrator when they weren't looking, and she went, first pop. Started up Hennepin Canal 9 a. m. At 11 o'clock overtook Bill Long in the "Gloomy Gus," broken down. Took him in tow. Proud moment. Have been laying for Bill for two years. Batteries no good, but Green got in Bill's boat and stole his while pretending to fix engine. Asked Bill why he didn't go to sea in a piano box. He got mad. Says he will meet us in Henry race. Got in at midnight. Fine little boat. Great trip. One long round of pleasure.

June 19. Started for Chillicothe 4 p. m. Doc, pilot. Myself, engineer. Nine passengers. Dark day. Water rough. Wheel dropped off two miles above bridge. Would have drifted home but passengers got agitated. Barnes came along and insisted on towing us home. Was very offensive. Asked us how it felt to travel so fast. Told him to wait until the Henry race, if he had nerve enough to go into it, and we would puff blue smoke in his face for 35 miles. He is the limit for conceit.

These are but a few sample entries, and as I read them over along with the rest, I live again the happy days of the summer, and pine energetically for spring. Neglect everything else, if necessary, but don't neglect your log. A dozen pages of a good profuse log read on a January morning will make you shovel snow for a week with a happy whistle.

AEROPLANE PHOTOGRAPHED BY ITS OWN CAMERA

An unusually interesting aerial photograph, reproduced by courtesy of L'Illustration, Paris, is here shown. It is a photograph taken at a height of 975 ft. above Breteuil, near Amiens, with a camera attached at the right front corner of the upper sustaining surface of a Zodiac biplane. It is claimed to be the first photograph of an aeroplane in full flight taken by a camera so attached.


Photograph of an Aeroplane in Full Flight Taken by a Camera Attached to One of the Wings

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¶The high cost of living does not seem to have included salt, as that commodity recently sold at the lowest price it ever obtained in the wholesale market—21.7 cents per barrel.

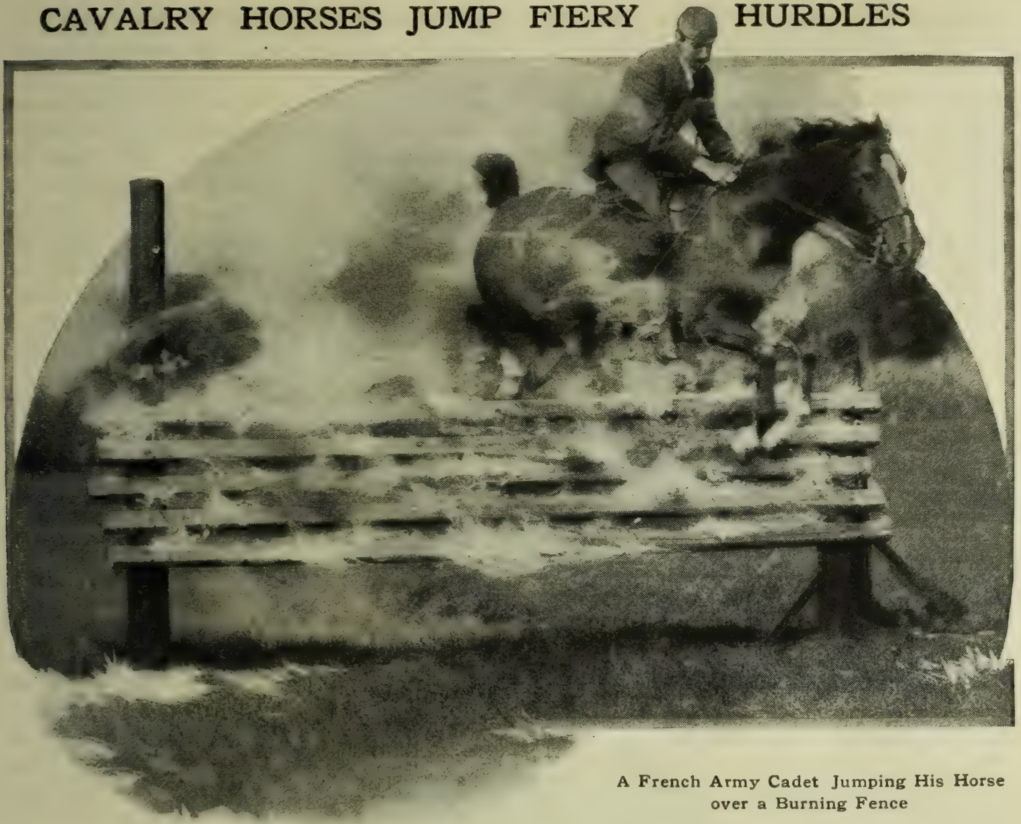
HARBOR PLANS INCLUDE MOTORBOAT PIERS

So great has become the importance of the motorboat as an agency of transportation on the Pacific Coast that it is now proposed in one city of the northwest to revise its harbor plans with the idea of providing motorboat landings and terminals on a large scale.

In Oregon and Washington as well as in San Francisco, boats propelled by internal - combustion engines are used in almost all classes of harbor work. In many of these places they are excluding the steam-driven vessels from towboat and other duties.

The authorities at Astoria, Oregon, have been among the first to recognize the necessity of providing special facilities for the docking of these vessels. Astoria is the home of an immense fleet of motorboats, and when plans were recently prepared for a comprehensive system of harbor development, which will include the diking of some 12,000 acres of land, the improvement of this plot with docks, etc., for motorboats was included. One of the features of the motorboat terminals provided in the Astoria plan is the construction of a large pier where supplies of fuel, oil and gasoline will be kept in large quantities. This pier will be so arranged that it will be a convenient distance from all of the various slips to be constructed. It is understood that similar plans are being made for other cities in the northwest.

CAVALRY HORSES JUMP FIERY HURDLES



A French Army Cadet Jumping His Horse over a Burning Fence

During the recent annual fête given by the students at the military school at St. Cyr, France, many unusual events were carried out, among which one of the most interesting was the jumping of horses over fences of fire. The illustration shows one of the mounted cadets going over one of the burning hurdles, the horse fearing the fire no more than its rider.

ELECTRIC HEAT IN FALL AND SPRING

Heating a house by electricity is economical only in times of the year when but a small amount of heat is required continuously, or as an auxiliary to the regular heating apparatus when a little extra heat is needed, according to experiments conducted in Connecticut by an electric-light company.

The house in which the experiment was conducted was a 13-room frame building of modern construction, and located on a more or less unprotected hillside. The regular heating system in the house is of the hot-water type, and the electrical heating units were installed in the bottom circulating pipe of the radiator. These units were arranged for two "heats," of which the high heat required 7,300 watts and the low heat 1,800 watts. These values were equivalent to approximately 21 watts and 5.2 watts, respectively, per square foot of radiating surface. Switches were provided at all the radiators, so that the heat could be turned off and on as needed.

Throughout the test, the power was

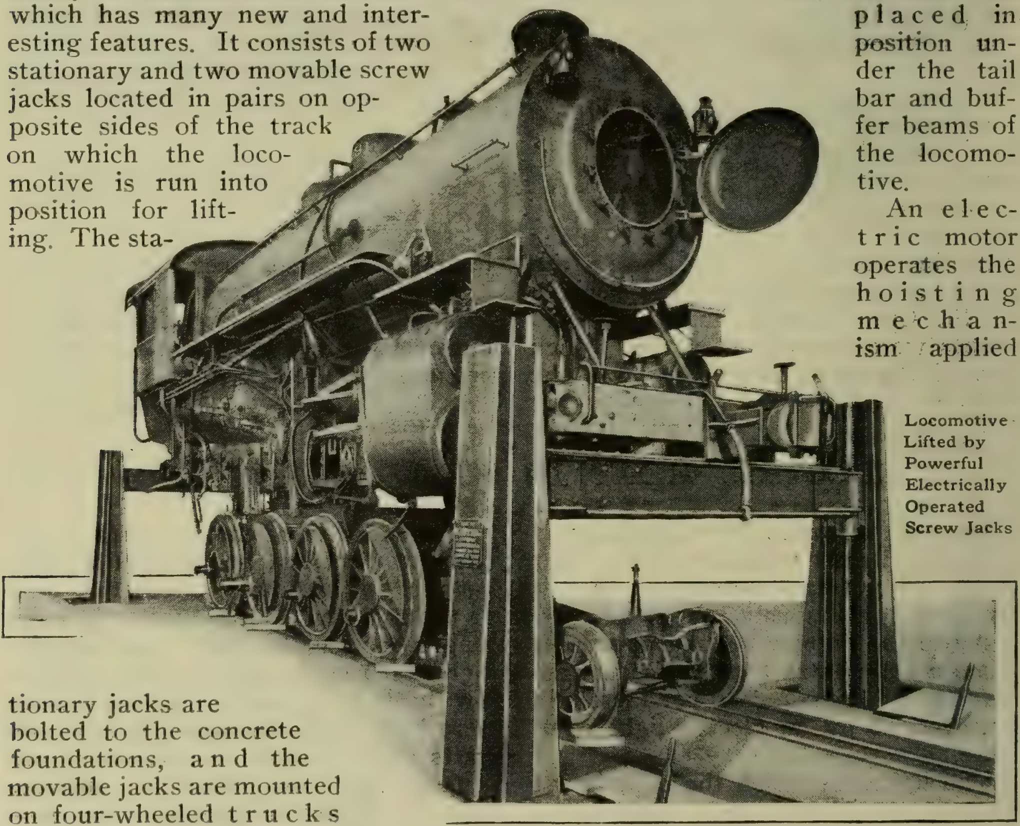
continuously applied during the night at the high or low heat, according to the weather, and either operated on the low heat, or shut off entirely during the day. By operating the heating system in this way, the house was warm in the morning, and the excessive waste of heat that usually accompanies the starting up of a coal furnace was avoided. The fire in the furnace was allowed to go out about the middle of April, and was not relighted.

The experiments showed that, with an outside temperature of 50 deg. F., or higher, this method of heating by electricity may be substituted for a coal-burning equipment, with a saving in money and care, and that it is a great convenience in localities where central-station companies are ready to give the customers a low rate for this particular kind of load. The method has also the decided advantage that it is available at all times, and may be put into service without any preparation, which is invaluable in localities subject to sudden changes in temperature. It may be used in combination with the ordinary heating plant during severe weather, and, as a result, the heating plant need not be worked above its normal efficiency.

ELECTRIC SCREW-JACK LOCOMOTIVE HOISTS

In the locomotive shops at Boone, Iowa, is installed a locomotive hoist which has many new and interesting features. It consists of two stationary and two movable screw jacks located in pairs on opposite sides of the track on which the locomotive is run into position for lifting. The stationary jacks are bolted to the concrete foundations, and the movable jacks are mounted on four-wheeled trucks operating on independent tracks, beneath the locomotive shop floor. A removable structural steel girder extends from each jack to its mate across the track, and these are placed in position under the tail bar and buffer beams of the locomotive.

An electric motor operates the hoisting mechanism applied to each hoist independently or in any combination desired.



Locomotive Lifted by Powerful Electrically Operated Screw Jacks

Under many conditions, this new type of locomotive hoist may displace the expensive overhead traveling crane and greatly reduce the cost of building construction, as, with its use, it will not be necessary to provide strength for the traveling crane.

COMPULSORY INSURANCE OF FOOTBALL PLAYERS

Notice has been sent to the chairman of the Scottish Football Association by the National Insurance Commission of the United Kingdom to the effect that football playing comes under the category of manual labor, and that football players must be insured, whatever their wages may be. It has been legally decided in England that a football player is a workman.

COMBINED SERVING TABLE AND CABINET

A combination silver cabinet and serving table, mounted on casters so that it can be moved about easily, has been placed on the market as an aid to perfect table service. The row of drawers down the center provide room for the various knives, forks and spoons. The glass-covered portion of the top serves to protect the wood from injury by hot dishes.

An Artistic Combination Serving Table and Silver Cabinet

LIFE PRESERVER BECOMES CHAIR OR BED

Lives may be saved by the use of the chair shown in the accompanying illustration. The inventor, an Englishman, designed it primarily for use on boats, though it is adaptable to other purposes as well. In case of disaster a person may safely plunge overboard with one of these chairs, as its buoyancy is sufficient to keep him afloat until help arrives. It is also a comfortable chair for ordinary use in the cabin. The inventor further points out that by turning the frame upside down the chair may be converted into a washstand. By removing the padded canvas from the frame and laying it on the floor, first rolling one end for a pillow, a fair substitute for a mattress may be obtained.

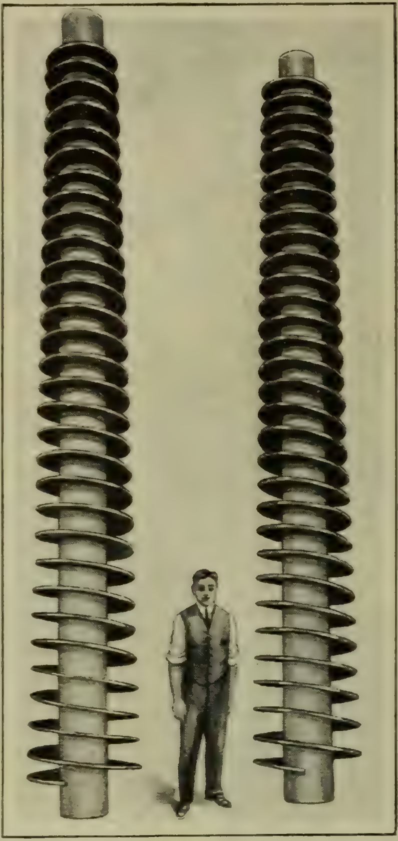
Novel Chair Which may be Used Variously as Life Preserver, Washstand or Mattress

UNUSUAL CALL FOR FIRE APPARATUS

A locomotive, drawing a freight train in Lowell, Mass., ran short of water and became stalled. It was impossible to fill the boilers again before they cooled, and, moreover, they were in danger of being burnt out if the fire were not extinguished. The Lowell fire department was appealed to by telephone, one of the hose carts responded as if to a real fire, and the fire under the boilers was extinguished in a few minutes.

GIANT SCREWS FOR FISH PRESS

Two unusual steel castings, both as to size and nature, were recently turned out by a machine company in the east. The castings are two screws to be used in a machine for pressing oil from fish. They are each 19¾ ft. long, and the thread upon them is 29½ in. wide at the large end and 20 in. at the small end. Each screw has a 6-in. core running through its entire length.



These Cast-Steel Screws, 19¾ Ft. Long and Weighing 7,590 Lb., are Used in a Fish-Oil Press

WHITE GUNPOWDER INVENTED IN GERMANY

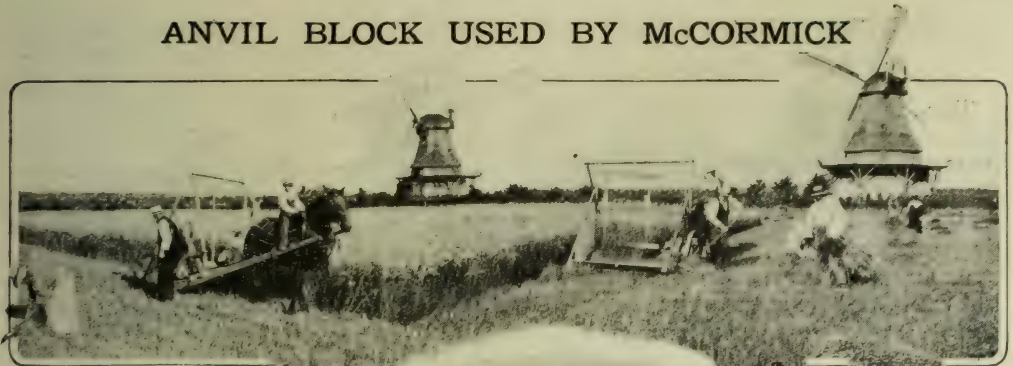
A German inventor, seeking a powder of higher explosive power than the common black powder, has produced what, because of its color, he calls "white powder." This powder is claimed to be much superior to the black, its higher efficiency depending upon the fact that its ingredients are prepared by a chemical - mechanical process instead of being ground in mills. As a result, each individual particle is immeasurably smaller than those of any ground powder, and the explosion takes place much more rapidly, and is much more complete.

The chief ingredient of the white powder is the cheap sodium saltpeter and certain other organic chemicals containing sulphur and carbon. These are all dissolved together in water, the solution being rapidly evaporated on revolving steam-heated drums, on the surface of which the solids settle in a very thin and homogeneous layer. This layer is scraped off by a knife. The process is said to be considerably cheaper than that of mechanical grinding, and without its dangers. The only drawback admitted is that the white powder readily absorbs moisture, and, therefore, must be kept in waterproof packages.

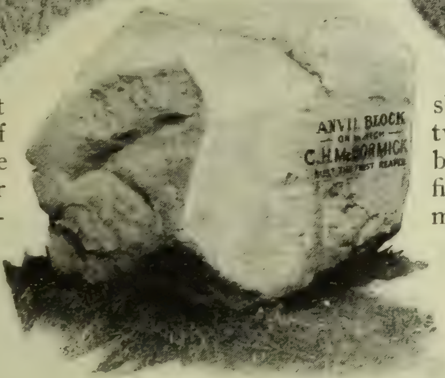
THICKER SKINS PROPOSED FOR BIG SHIPS

Increased tonnage and speed without corresponding increase of shell strength increases the vulnerability of a ship in collision, is the contention of Sir Bradford Leslie, in a letter to the London Times. This, he says, is the most important part of the lesson of the "Titanic" disaster that should be known and understood, conflicting as it does with the preconceived idea of the unsinkability of large ships. It is in evidence, writes Sir Bradford, that the skin plating of the "Titanic" was 1 in. thick. While sufficient to sustain maximum strains due to ordinary causes, he declares it is inadequate to afford reasonable security against penetration, rending, or buckling in cases of collision of 40,000 or 50,000-ton ships with icebergs, derelicts or other vessels. As compared with a smaller ship, the writer declares the thickness of the "Titanic" plating should have been 4 in. instead of 1 in., adding: "The danger lies in the mass of the ship; subdivision by bulkheads will not prevent a 50,000-ton ship with 1-in. plating from being cut in two."

ANVIL BLOCK USED BY McCORMICK



Original Reaper, Parts of Which were Made on the Granite Anvil

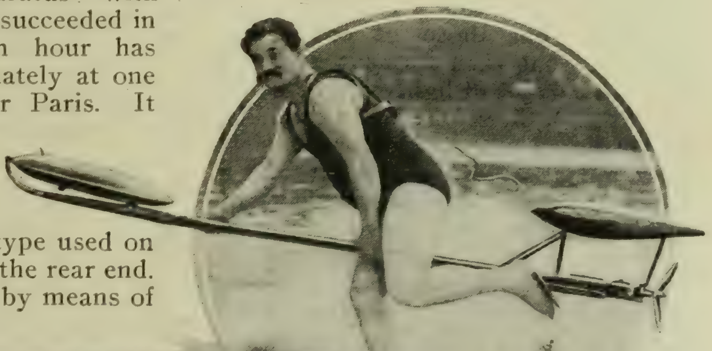


The Anvil Block on Which Cyrus H. McCormick Fashioned the First Practical Reaper

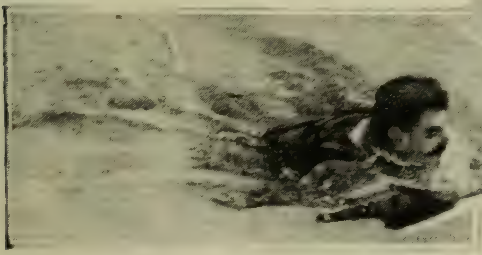
One of the most valued possessions of the McCormicks' is the solid old stone boulder shown in the accompanying illustration. It is the primitive anvil used by Cyrus H. McCormick, and on it he fashioned the ironwork of the first reaper. It is quite probable that he also shaped upon it the two plows invented by him in 1830. The first practical reaping machine ever made was built by him in 1831. McCormick moved to Chicago in 1847, where he built extensive works and began manufacturing reapers.

SCREW-PROPELLED SWIMMING APPARATUS

A swimming apparatus with which the inventor has succeeded in attaining 16 miles an hour has created much interest lately at one of the waterways near Paris. It consists of a plank, about 6 ft. long, with metal floats attached at each end, and a screw propeller of the type used on motorboats mounted at the rear end. The propeller is driven by means of pedals.



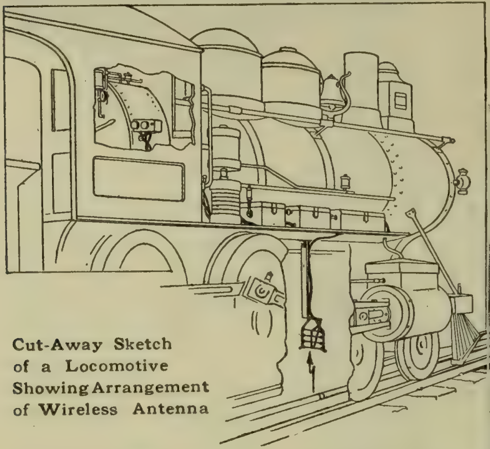
The Inventor and His Apparatus Ready to Enter the Water



Gliding through the Water at a Fair Rate of Speed

WIRELESS SAFETY DEVICE FOR TRAINS

The engineers of the Canadian Pacific Railroad have just tested, at Toronto, a wireless device for the prevention of railroad collisions, for which the inventor, Mr. F. W. Prentice, claims such absolute reliability that an engineer could drop dead in his cab, with the throttle wide open, and the moment a danger point was reached the wireless control would stop the train within 35 car lengths.



Cut-Away Sketch of a Locomotive Showing Arrangement of Wireless Antenna

The device is a block system, the blocks varying from 1,500 to 16,000 ft. in length. The rails of each block are insulated from those of connecting blocks so that each forms a separate circuit, a current of light voltage being sent through them. Between the rails, and insulated with wood for physical protection, is a wire connected with a generator which furnishes a wave of high efficiency. This wave jumps 14 in. above the wire for the length of the block, so that an antenna, or aerial, suspended beneath the engine 14 in. from the roadbed, catches the wave, and flashes a green light in the engine cab. If a train is on the block ahead, if there is a broken rail, a landslide or any other obstruction, the rail circuit is broken and the generator ceases to send out its waves, the green light in the engine behind changes to red, thus apprising the engineer of danger. If this danger signal, for some reason or other, is disregarded, the air brakes are automatically applied after a lapse of 10 seconds and the train thus brought to a stop. On the other hand, the engineer can, by pressing a button, prevent the automatic setting of air brakes and proceed at a predetermined reduced speed, governed by another mechanism, until the train has approached near enough to ascertain the nature of the danger or a safety signal has been received.

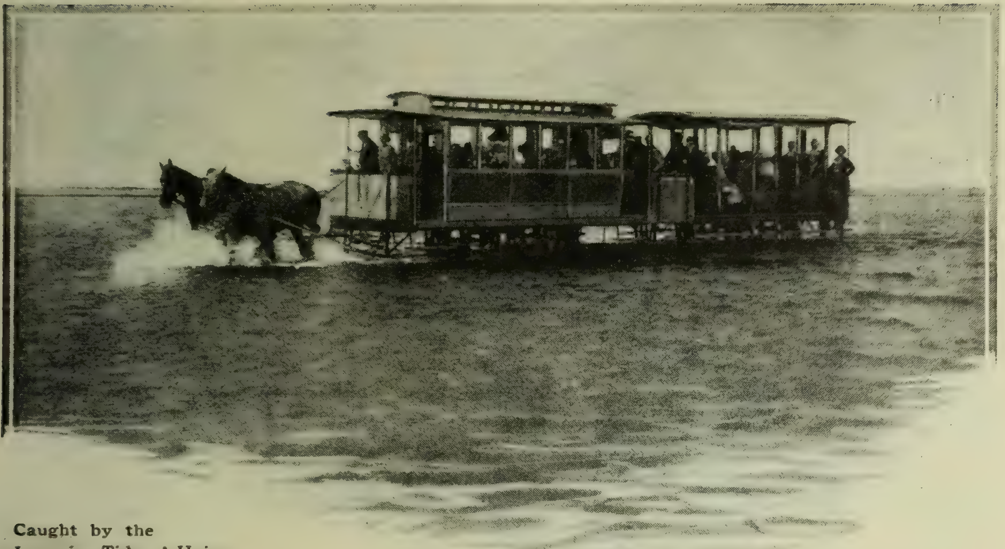
In the various tests to which this signaling system has been subjected, it has been found to work successfully in the different circumstances, which up to this time it has encountered.

Wire Laid Between the Rails along Which Electrical Impulses are Carried to and from the Moving Train

MOTION PICTURES FOR MEAT EXAMINATION

The food inspectors in the slaughtering houses of Berlin have been using the motion-picture camera for some time as an important mechanism for meat inspection. Motion pictures are taken of the meat to be examined and are then projected on a screen. If the meat is unsanitary, moving micro-organisms show on the projected image.

ℭA statistician has calculated that during the last 12 months there were 22,000,000,000 telephone calls sounded in the world, of which number the people of the United States used 14,500,000,000.



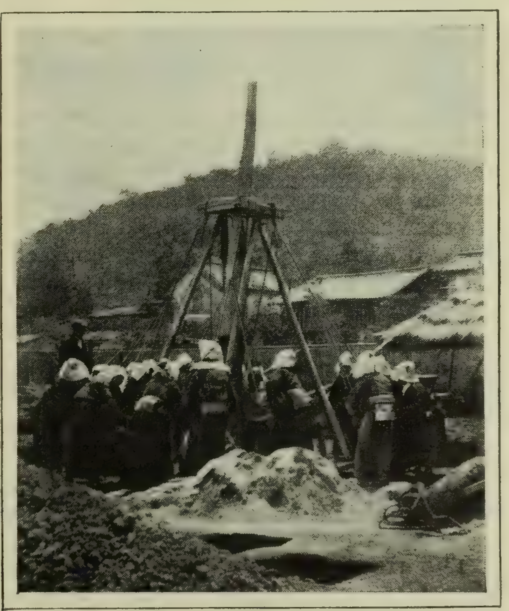
Caught by the Incoming Tide: A Unique Horse-Car Line in Germany

A HORSE-CAR LINE IN THE OCEAN

A horse-car line apparently running on the water of the North Sea is one of the unique sights of Langeoog, Germany. People arriving at Langeoog by boat can land only at ebb tide, and the railway was built to take them to the real shore. Very often the incoming tide catches up with and gets ahead of the horse-drawn cars before the shore is reached, and the sight presented is then as shown in the accompanying illustration.

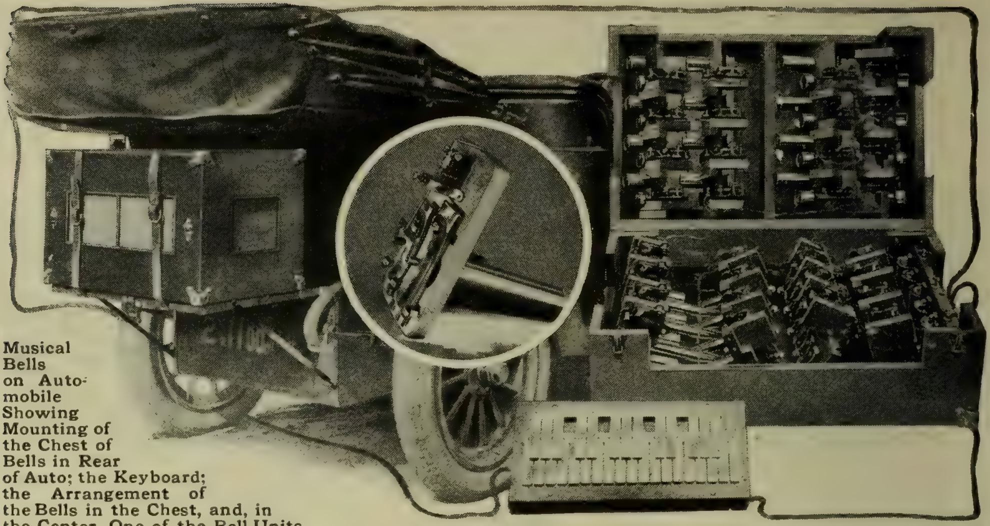
JAPANESE PILE DRIVER OPERATED BY WOMEN

The pile driver of old Japan is a crude but effective implement always operated by women under direction of one man. Each woman pulls on a separate rope attached to one of the main cables, of which there are usually four. As many as 15 or 20 women are used to work one pile driver. The pile drivers are used for tamping ground for foundations as well as for driving piles.



A Woman-Operated Pile Driver in Japan

ℭScientific management has now entered the kitchen, a mathematically inclined housewife having discovered it required three quarters of an hour to wash 80 dishes, whereupon she cut out unnecessary motions and reduced the time to half an hour.



Musical Bells on Automobile Showing Mounting of the Chest of Bells in Rear of Auto; the Keyboard; the Arrangement of the Bells in the Chest, and, in the Center, One of the Bell Units

BELL CHIMES FOR MOTOR-CAR MUSIC

The latest idea in musical novelties is the invention of a Chicago man, who has recently perfected a contrivance of electrically operated musical bells that can be carried on an automobile, thus making it possible to play tunes while touring through the country. The machine consists of a set of 32 bells, tuned so as to form two and one-half octaves of the musical scale. The bells are compactly arranged in a rectangular box, 20 by 30 by 20 in., which is carried on the rear of the motor car, and, when covered, has much the appearance of an ordinary automobile trunk. The apparatus is operated by means of a series of brass contact keys arranged like the keyboard of a piano. This contact board may be moved about the car and played from any seat. The bells are controlled by small electromagnets and three dry cells serve to operate the whole system.

STAMP-AFFIXING AND CANCELING MACHINE

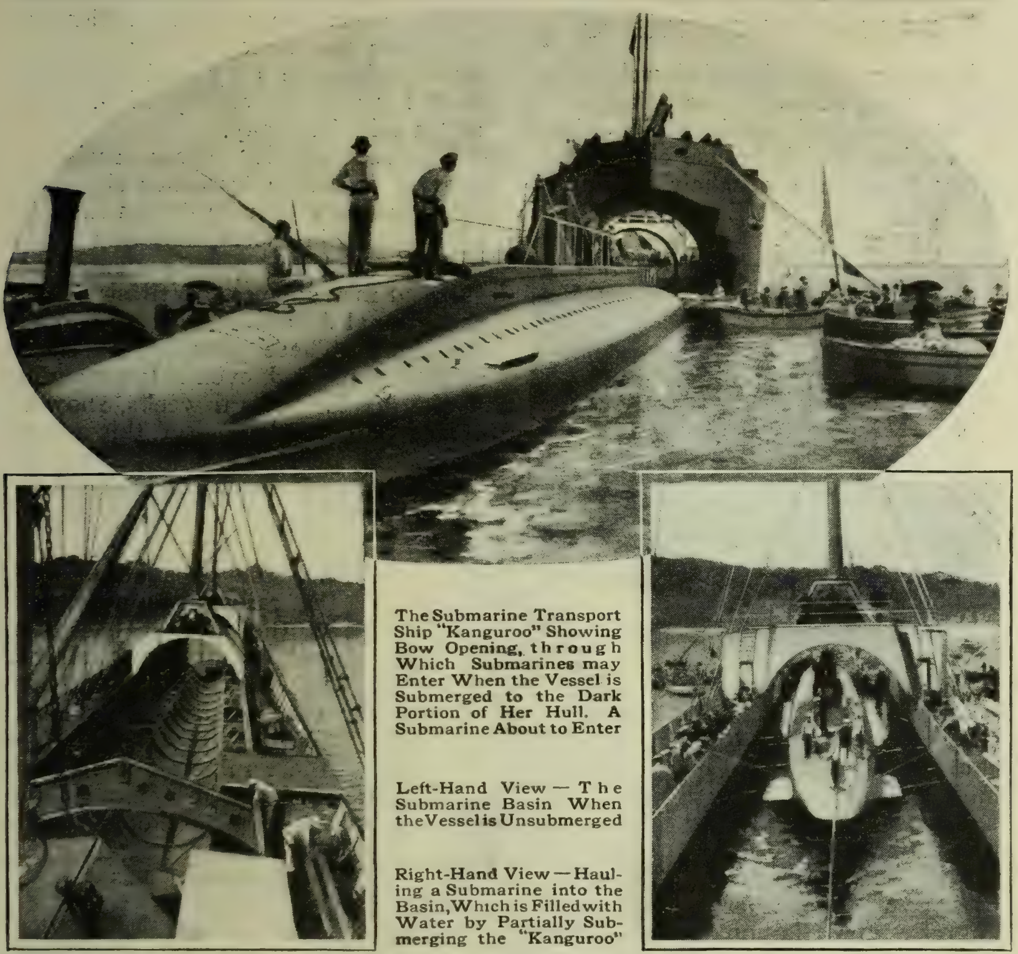
An automatic stamp-affixing and canceling machine which is said to be a marvel of mechanical accuracy has been installed for some time in the post office at Berlin, Germany. It handles all kinds of mail matter, including letters, post cards, newspapers and other printed matter; stamping, canceling and counting each individual piece of mail, thus furnishing a means of checking the amount of cash receipts with the number of stamps of various denominations placed in the machine.

The machine is used for handling the mass of mail received from large concerns. All the clerk has to do is to run this mass of mail through the machine, and charge or collect the postage in accordance with the count of the machine.

Such a machine is also adapted to be used in the offices of large mercantile houses.

NEW TRANSPORT SHIP FOR SUBMARINES

The transport ship built in France for a German submarine-building concern for use in conveying submarines ordered by foreign governments to distant ports has several interesting features. An opening in the bow of the



The Submarine Transport Ship "Kanguroo" Showing Bow Opening, through Which Submarines may Enter When the Vessel is Submerged to the Dark Portion of Her Hull. A Submarine About to Enter

Left-Hand View — The Submarine Basin When the Vessel is Unsubmerged

Right-Hand View — Hauling a Submarine into the Basin, Which is Filled with Water by Partially Submerging the "Kanguroo"

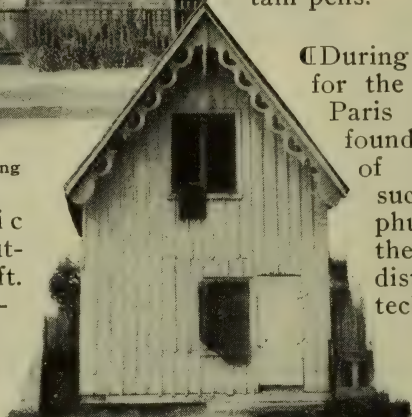
Courtesy of The Sphere, London

vessel, which is called the "Kanguroo" because it carries the little under-water fighters somewhat as this animal carries its young, allows of the ingress and egress of a submarine when she is submerged to the beginning of the dark-colored portion of her hull. Three sets of derricks are fitted to the steel bridges which span the submarine basin of the "Kanguroo," which can be converted into a floating drydock in a very short space of time. The bow opening, of course, is closed when the vessel is on an ocean voyage.

THREE OLD DIMINUTIVE BROOKLYN CHURCHES

Brooklyn, the "city of churches," has three exceptionally small houses of worship, located within a half mile of each other, which arouse considerable interest because of their diminutive size. The Apostolic church, located in Putnam Avenue, is but 25 ft. square, and has a seating capacity of about 50 persons, while the Primitive Methodist church in Glasson Avenue has a seating capacity of 80 persons. The third church illustrated is an African Methodist church having a congregation of only 19 members.

The Apostolic Church has a Seating Capacity of about Fifty



An African Methodist Church Having a Congregation of Only Nineteen Members

THE COMMERCIAL USES OF TANTALUM

Outside of the laboratory the rare nonmetallic element known as tantalum was scarcely known until a few years ago when it first found a commercial use in incandescent lamps. It gained its name because of the "tantalizing" difficulties the chemists had to overcome in producing it in a pure state from the minerals in which it occurs. With the advent of electrical reduction processes, however, its production became easy and it is now used for a great variety of purposes, at least in Germany.

Because of its great resistance against corrosion by other chemicals, and because it can be drawn into fine wires and thin sheets, tantalum is now largely used for certain dental and surgical instruments. Writing pens of exceptional durability are also made of tantalum. These pens are as elastic as steel pens, and, even if left standing in the ink for several weeks, show no trace of corrosion. For this reason tantalum pens are supplanting the more expensive gold pens for fountain pens.

¶During the excavation work for the railway tunnel under Paris the subsoil has been found to contain a number of unexpected minerals, such as silver, native sulphur, etc. Samples of these minerals have been distributed among the technical schools under such curious labels as "silver-bearing sand from Boulevard Montmartre," "sulphur from Rue Richelieu," and the like.

Primitive Methodist Church Seating a Congregation of Eighty

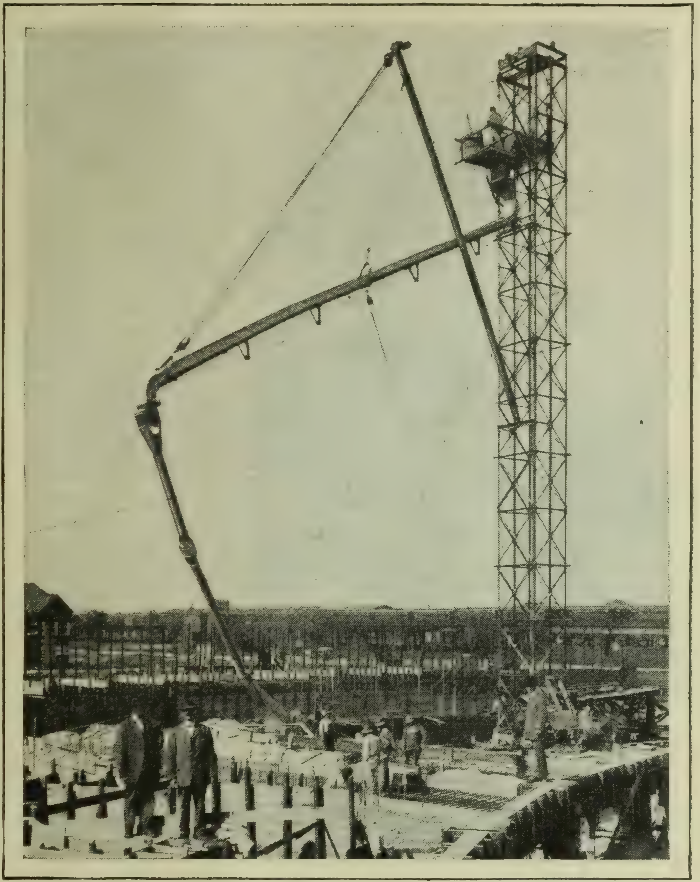
LEAD-POISONING CASES AT BROOKLYN NAVY YARD

A large number of cases of lead poisoning, one an aggravated case with paralysis, were reported recently at the Brooklyn navy yard. Investigation showed the afflicted men had all been employed in "scaling" lead paint in the double bottoms of battleships. A battleship has a space, from 2½ to 3½ ft. in depth, between the inner and outer shells of the bottom. This space is divided into small compartments usually not more than 5 or 6 ft. square, and the paint lining these compartments is sometimes a quarter of an inch thick. The "scaler" crouches on his knees and operates a compressed-air chisel which strips off the paint.

In all, 20 men were at this time found to be suffering from lead poisoning caused by work in the double bottoms, but nearly half of the men employed in this work had been affected at one time or another; many of them had lost much time because of sickness, and two had died as a result of poisoning.

¶An ancient French law forbidding the drawing of water from the sea has caused a rather absurd situation at Nantes. When the supply of fresh water gave out temporarily, the contractors building a dike at the mouth of the Loire used sea water. When the work was finished the contractors were greatly astonished to receive notice from the revenue authorities claiming payment for the salt water, under the old law.

MOVABLE DISTRIBUTING TOWER FOR CONCRETE



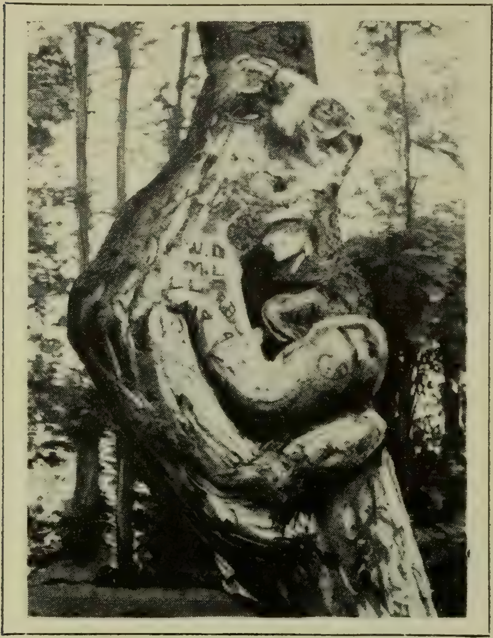
The Traveling Tower Used to Place the Concrete of a Railroad Roundhouse in Chicago

The concrete-distributing tower used in the construction of the new roundhouse of the Lake Shore & Michigan Southern Railroad in Chicago, has several interesting features. The roundhouse being 405 ft. in diameter, the concrete had to be distributed over a large area. The cost of a series of wooden towers for the placing of the concrete was found to be prohibitive, so the contractors decided upon one tower of portable nature.

The 72-ft. steel tower was erected on heavy wooden skids provided with steel liners which rest on railroad rails. After the concrete has been placed in one section, the guy wires are loosened, and the tower is drawn back along the rails to the next position, a hoisting engine providing the drawing power.

TREE TRUNK LOOKS LIKE CLIMBING BEAR

Among curious formations of nature a noteworthy one is the "Climbing-Bear Tree," at Kenoza Lake, N. Y., shown by the accompanying picture. The tree is a native pine and the natural growth is on the main trunk about 4 ft. from the ground. Thousands of people view this freak every year, and the initials and other markings made by them have left many scars on the trunk. Mutilation of this curiosity became so extensive as to threaten it with destruction, and the tree has now been inclosed by a high fence.



A Curious Growth on the Trunk of a Pine Tree, Resembling a Climbing Bear

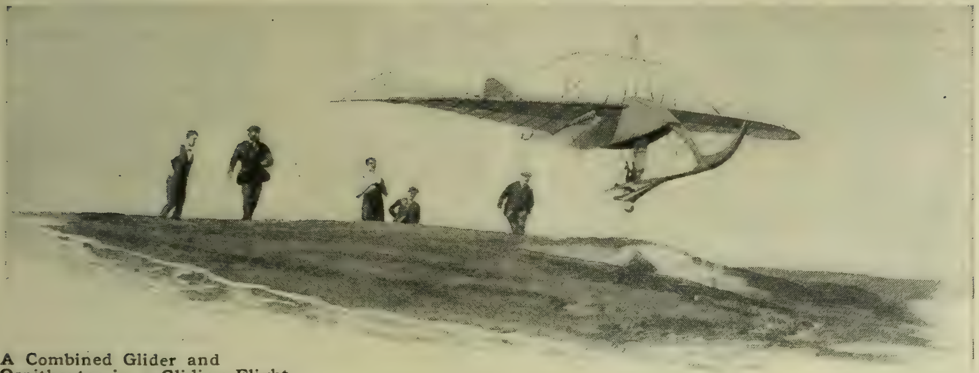
BRICK COLUMN WITHSTANDS TREMENDOUS PRESSURE

A pressure of 6,580,000 lb. was required to crack and partially break a brick column, 12 ft. high and 3 ft. 11½ in. square, in a recent exhibition before a party of material-testing experts in Pittsburgh. The demonstration was made both for the purpose of showing the work of the new government testing machine recently purchased by the Bureau of Standards, and to give an idea of the resisting power of ordinary brick and cement to tremendous pressures. The brick column was erected 30 days before the test and was thoroughly dried out. The mortar used consisted of one part Portland cement and one part sand, and is regarded as very much superior to the average mortar. Several days before the final test, pressures up to 4,700,000 lb. were applied to the column without noticeable result, although markings were registered on an instrument placed on the column for the purpose. On the day of the test, the heavy pressure that had previously been applied was relieved and, beginning with 1,500,000 lb., the tension was gradually increased until the column broke. After the test the column was shown to have retained its strength in the center, the breaks occurring only on the surface of the sides. The Pittsburgh testing station of the Bureau of Standards is equipped to apply tests up to 10,000,000 lb.

SEAWEEDS PROPOSED AS FOOD

The food value of seaweeds has been studied by Mary D. S. Rose, assistant professor of nutrition in Columbia University. From the analysis of seaweeds it would seem that they would be as good foods as the ordinary vegetable, since they contain an average of three per cent of fat-producing stuff, and 14 per cent of substances convertible into sugar. On the average, however, only about half of the latter seem to be useful as a food. Various kinds of seaweed have long been used as food and as relishes in Japan.

¶At exhibitions with hydro-aeroplanes in Europe, some airmen have introduced the novelty of illuminating their machines with colored electric lights at night.



A Combined Glider and Ornithopter in a Gliding Flight

MOTORLESS WING-FLAPPING AEROPLANE

The growing interest evinced in the "aviette," which is the name given wing-equipped bicycles, and the recent failures of such machines to fly, has drawn attention to the fairly successful trials of a remarkable English machine of similar nature.

This machine is a combination of a glider and an ornithopter or wing-flapping type of machine. The wings, which, in gliding flight, are held stationary like those of the ordinary aeroplane, can be moved in such a way as to give a propulsive effect when actuated with the foot pedals provided for the purpose, but no work is required by the airman to keep them extended in the proper plane for gliding.

Up to the present time, however, the machine has only been launched from the side of a hill like the ordinary glider, no attempts having been made to raise it off the ground by flapping the wings. Also, a weight equal to that of a man has taken the airman's place in the number of short successful glides it has made.

A SOURCE OF WHITE FALSE HAIR

While fashion is decreeing many pinned-on puffs and braids, the white-haired woman would fare scantily if it were not for the long fleece of the Angora goat. A switch made of natural white hair costs in the neighborhood of $300 and is often

Two Angora Goats from Whose Fleece $3,000 Worth of False Hair Was Made unobtainable. The goats shown in the illustration are the property of a Montana man. Their fleece last year was about 22 in. in length and the yield of both of them was close to 42 lb. This fleece was sold to a New York manufacturer of hair goods for $6.50 per pound, or a total of $273. After being made up into switches this fleece retailed for a little more than $3,000. Every scrap of the fleece was utilized.

CAN LIFE BE MADE FROM CHEMICALS?

Is it possible that the scientist with a test tube and a few simple, well-known chemicals before him may artificially originate life? The question is just now being asked all over the world, and variously answered in the negative or affirmative, the present lively discussion of the subject being due to a recent address before the British Association for the Advancement of Science by its president, Edward A. Schäfer, professor of physiology in Edinburgh University, who threw out suggestions which hint at this startling possibility.

He does not say that this has been done, as has been reported, nor does he say that he has attempted it, but he sees no reason to doubt that it may be done. He says the problems of life (as distinguished from soul) are essentially problems of matter, and must be investigated by the same methods; that living beings are governed by laws identical with those which govern inanimate matter, and that, therefore, the manifestations of life may be explained without the aid of any special unknown form of energy. The most obvious of these manifestations are spontaneous, or voluntary movement, whether in a highly organized being, like a human, a dog or a bird, whose motions may be most complicated, or in the little mass of slime, called the slug amœba, which shows life only by throwing out projections of its structureless substance. This so-called amœboid movement is also possessed not only by individual cells of the more highly organized beings, such as the white blood corpuscles, connective-tissue cells, growing nerve cells, and young cells everywhere, but may, likewise, be observed in inanimate substances and mixtures, as, for instance, oil drops, globules of mercury, solutions of certain salts, etc., in which latter, however, the movements are caused by purely chemical reactions, that produce changes in the surface tension of the fluids under examination.

Professor Schäfer believes there can be no doubt that the complex actions characteristic of the cells of higher organisms have been developed, in the course of evolution, from the simple movements of the slime, or protoplasm, referred to. He also believes that in many well-known chemical and physical phenomena and reactions, other essential processes of life are more or less exactly imitated in the inanimate world, the crystallization of salts being one example.

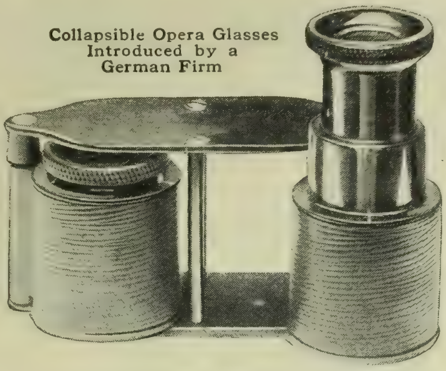
The elements composing living substance are few in number, well-known and either already existing in nature or easily producible. The combination of these elements into a compound containing about 70 per cent of water represents the chemical basis of life, (protoplasm), and when the scientist succeeds in building up this compound from its simple elements, Professor Schäfer considers it probable that it will exhibit the phenomena which we call life. He insists that life originated from the simple chemicals or elements, composing the protoplasm, taking countless ages, perhaps, to arrive at the elementary state of living matter represented by the slug amœba and the simple cell with a nucleus or kernel like the white blood corpuscle or the connective-tissue cell, which is the ultimate basis of all higher forms of life, even of man himself. This process of origination and evolution of life is going on constantly, Professor Schäfer states, and he sees no reason why the chemist should not eventually succeed in producing life in its most primitive form in his laboratory.

The success of previous workers along this line in fertilizing the eggs of certain low forms of animal life by means of chemical substances, so that they will hatch out in the natural way, may be considered to confirm Schäfer's theory of the chemical origin of life, and his belief that in its simplest form, at least, it can be produced artificially.

¶ A French court has recently decided that since all public officials are required to have completed their compulsory military service before taking office, and as no military service is exacted from women, women are not eligible for any government positions in France.

FOLDING OPERA GLASSES

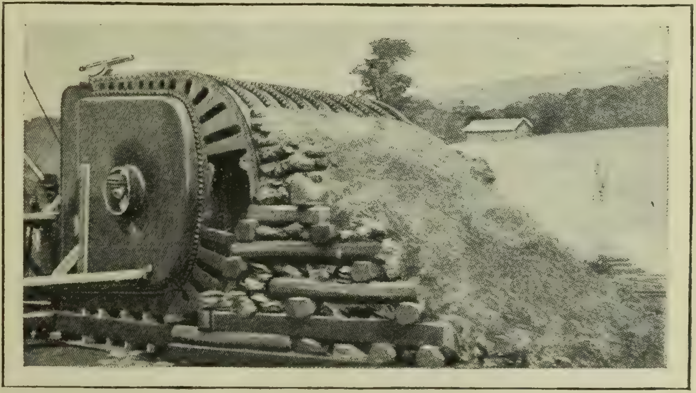
A novel folding opera glass has just been introduced by a firm of German opticians. The lens tubes are collapsible like a telescope, and may be shut by a slight twist of a finger-and-thumb hinge. The glasses collapse into an exceptionally small space.



Collapsible Opera Glasses Introduced by a German Firm

SAFE RETREAT FOR BOILER-TEST OBSERVERS

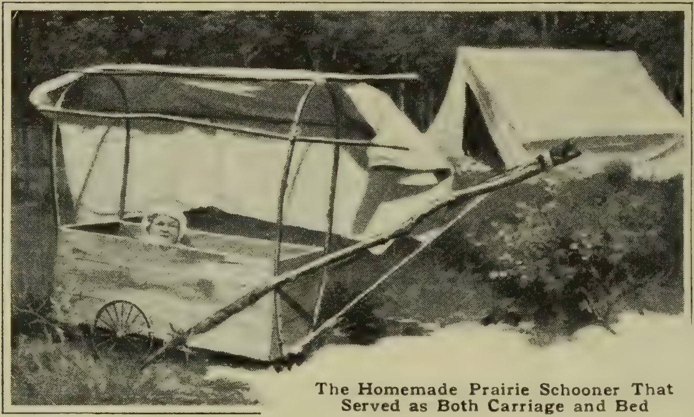
Protection for observers of recent low-water locomotive-boiler explosion tests, made at Coatesville, Pa., was afforded by a bomb-proof "fort" erected directly back of the boilers and about 250 ft. away. As shown in the accompanying illustration it was formed of an engine firebox laid upon its side and protected on the exposed side by a cribbing of ties with a cinder filling. The official observers stood back of this on a platform from which they could look over the top of the fort toward the boilers. Telescopes were mounted on the top of the firebox by means of which the steam gauges and water glasses of the boilers under test could be read. At the rear of the platform were placed indicators which disclosed to the observers the fall of the water level in the boiler under test and the boiler pressure. In addition to the "fort," a grandstand was erected at a safe distance, and from this vantage point 8,000 persons, including railroad men, government officials, engineers and scientists of America and Europe, witnessed the tests.



From This "Fort" Official Observers Witnessed Locomotive-Boiler Tests

CAMP BABY HAS PRAIRIE-SCHOONER BED

A successful arrangement by which the "young hopeful" can share the camp in the wilds was contrived with a single pair of wheels from a baby cart. A provision box forms the body of the vehicle, while willow sticks provide the tongue and ribs. A piece of rubber tablecloth keeps the showers off in the daytime, and at night a mosquito bar is thrown over all for the benefit of the youthful complexion.


The Homemade Prairie Schooner That Served as Both Carriage and Bed

PAPER FRAMEWORK FOR GAS MANTLES

A novel way of making gas mantles has just been discovered by Professor Pierucci of the University of Pisa, in Italy. He has recently invented a new kind of paper which conducts electricity fairly well, and which, he claims, can be used in making gas mantles. These mantles are said to be stronger than those now in use, and it is said they will be cheaper, for they can be made from smaller quantities of the rare thorium and cerium oxides which are used in all gas mantles. The mantles are woven from fine strips of the paper, and then soaked in a solution of the thorium and cerium salts. After drying, the paper is burned out, leaving a mantle similar in composition to the one now used.

GOLD AND SILVER HARDENED BY TITANIUM

A method of hardening gold and silver by the use of titanium has been patented by a titanium company of Niagara Falls, N. Y.

The wearing qualities of such articles as sterling-silver knives, forks and spoons, for instance, will be much improved by this method of hardening.

In adding titanium to sterling silver or gold, an alloy of copper and titanium is first made up, containing 99 per cent copper and 1 per cent titanium. This alloy is then used for making sterling silver or alloyed gold. Sterling-silver articles of such composition would contain 925 parts silver, 74.25 parts copper, and 0.75 parts titanium.

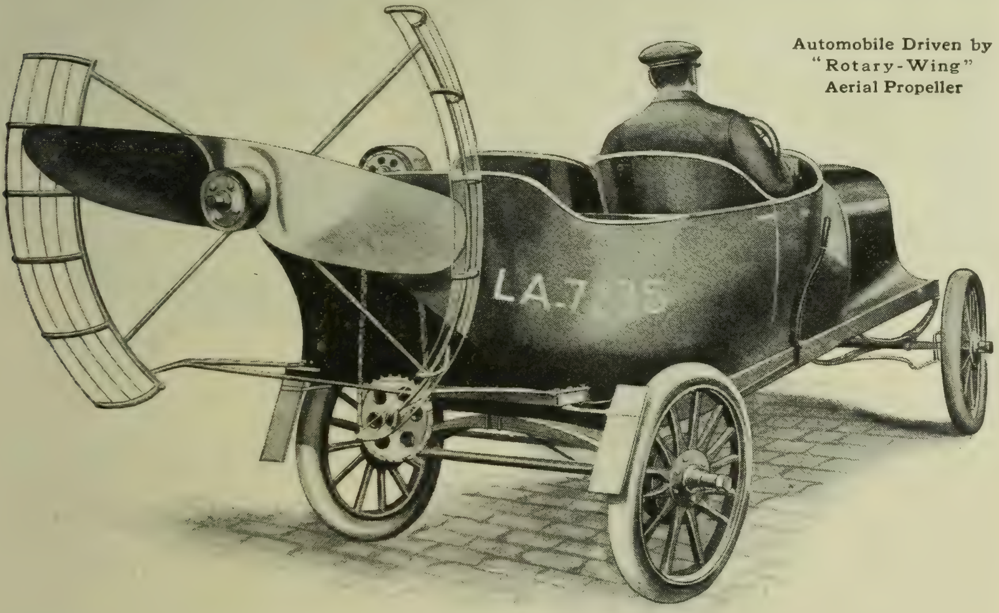
MOLASSES USED TO LAY DUST IN AFRICA

The use of molasses to lay the dust in the diamond-mine section of South Africa bids fair to turn that section of the world into a huge sheet of flypaper, according to African Engineering. It has been attended with great success wherever tried, and possesses, it is stated, many advantages over water and other dust layers. The molasses is used in a diluted state, and not only covers over dust in the roadways, but absorbs dust and moisture from the atmosphere as well. The only difficulty in the use of the solution is the resulting mud which is very sticky and makes the streets and roads where it has been used most uncomfortable for ordinary use. The scientists employed in the mines are now working on schemes to overcome this objectionable feature. Immense quantities of molasses can be secured from the Natal plantations at a very low price, so that the use of the sticky fluid is the most economical solution of the dust evil to be found in that section of the world.

ROTARY-WING PROPELLER FOR AUTOMOBILES

The aerial-propeller-driven automobile of Bertrand de Lesseps, a brother of the well-known airman, has shown itself particularly efficient, due, according to the inventor, to the peculiar shape of the propeller, which is called a "rotary-wing." The shape and curve of the propeller are based on those of a bird's wing.

The first long trip of the automobile was from a suburb near Paris, to Lyons, a distance of some 250 miles, during which it maintained a fairly high speed without trouble of any kind. Later, the automobile was lashed upon a scow which carried a load of 270 tons, and succeeded in propelling it on the River Rhône at a speed of 5 miles an hour downstream, and two miles an hour against the current. The scow was as manageable as if driven by the ordinary marine propeller, turning, backing, and going forward again under perfect control.



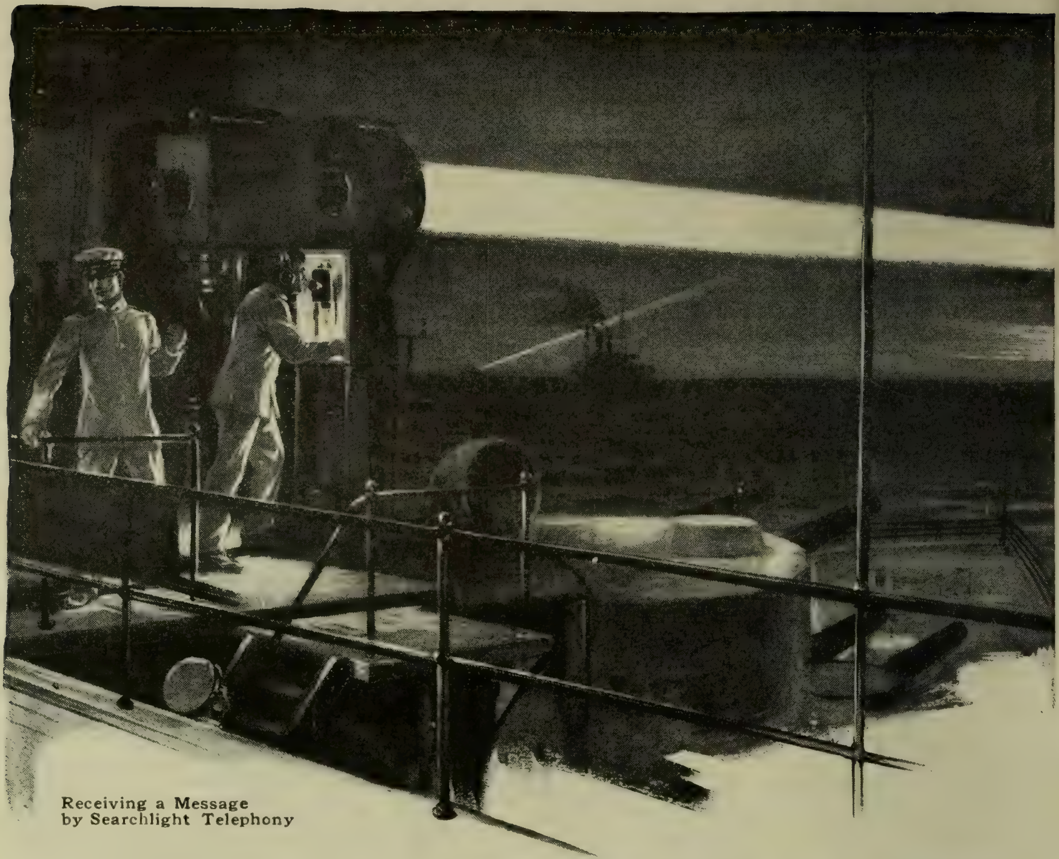
Automobile Driven by "Rotary-Wing" Aerial Propeller

GERMAN ARTIFICIAL RUBBER

The process of making artificial rubber, the latest triumph of chemical science, is not yet available for industrial application, according to Dr. Carl Duisberg, president of the Society of German Chemists and a leader in the discovery.

"You may have received the impression," said Doctor Duisberg, in addressing the Eighth International Congress of Applied Chemistry in New York, "that the problem of preparing this rubber—understand that it is real rubber and not a substitute for rubber—had been solved. Yet, if you ask me to answer you, honestly and truly, when synthetic rubber will bring the millions which prophets see in its exploitation, I must say that I do not know. But the stone is rolling and we will see to it that it reaches its destination. Artificial rubber may soon play as important a rôle in the markets of the world as does natural rubber now."

Doctor Duisberg exhibited a variety of articles made of the German artificial rubber. Among them were two excellent specimens of automobile tires, one a heavy 5½-in. tire, the other a



Receiving a Message by Searchlight Telephony

4-in. tire, which he had taken off his automobile before starting for America. Both tires had run over 4,000 miles, and yet they appeared to be just as good as new. The original tread had not yet worn off, the only evidence of wear, in fact, being the seasoning of the original rubber color to a light brown.

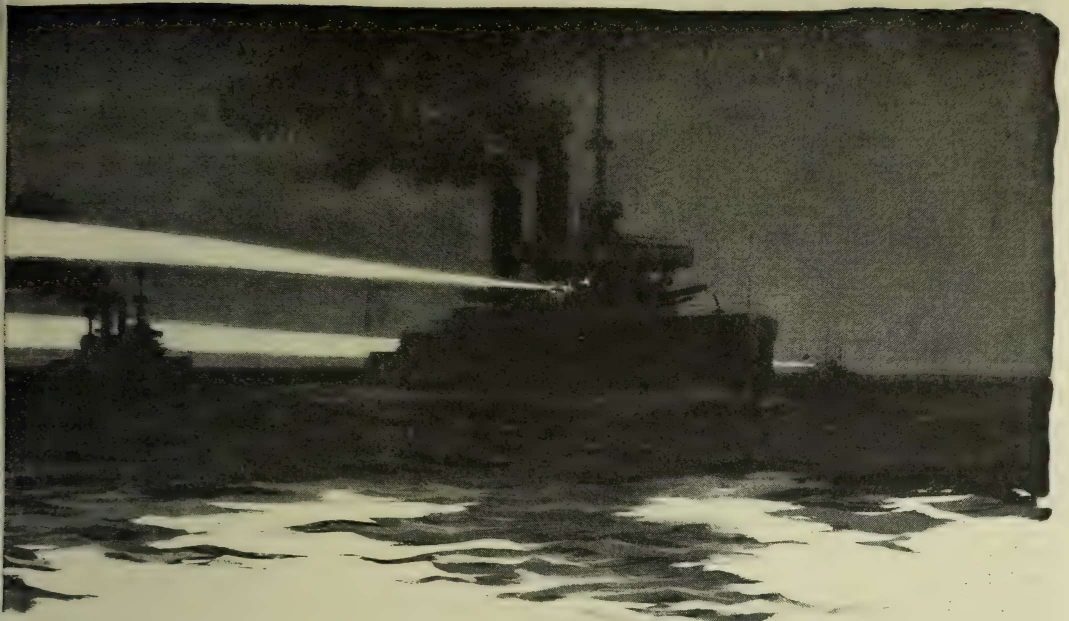
Another exhibit was a ball made of artificial rubber. He dropped the ball to the floor and it sounded like so much lead. Then he applied heat to the plastic ball for a few seconds, and threw it to the floor with force. It bounced 20 ft. into the air, landed on the head of one of his assistants on the stage, and rebounded into the auditorium.

ℭThe University of California has instituted a chair of automobile science, this being the first university to recognize the motor car in so distinctive a manner.

TELEPHONING WITH SEARCHLIGHTS

Transmitting speech by means of beams of light, which is the way the earliest experiments in speech transmission were carried on, is to undergo extensive tests to determine its usefulness as a means of communication between ships in a battle fleet. So far, the gas-searchlight telephone has not proved effective in a range of more than three miles, even though the searchlights employed were of the most powerful type, but progress is hoped for through the continued experiments.

In the beam-of-light method of telephony a microphone drum is so placed as to put the flame in a state of vibration corresponding to the speech waves. A large beam of light so controlled can be projected by means of a mirror to a considerable distance in the form of parallel rays, and at the receiv-



ing station can be concentrated upon a photo-electric cell of crystalline selenium, the resistance of which will vary according to the illumination and so affect a telephone receiver.

One of the most important features of searchlight telephony is that a message cannot be picked up except by those in line with the light beams.

HAND-DRIVEN GENERATOR FOR WIRELESS OUTFIT

A hand-driven generator has been developed by the United States Signal Corps to furnish electricity for the operation of portable wireless-telegraph outfits. It comprises a small generator having a rotor turned by hand cranks through suitable gearing. Two cranks are provided, and one or two men may be employed to turn each. A low and high-speed release disengages the driving gear when the speed rises above or falls below a predetermined limit, so that the rotor may be kept at a fairly constant speed. The generator is light enough to be packed on a mule, and is capable of turning out about 200 watts, which gives the wireless outfit a sending radius of about 15 miles.

CONVEYOR HAS SAFETY STOP SWITCHES

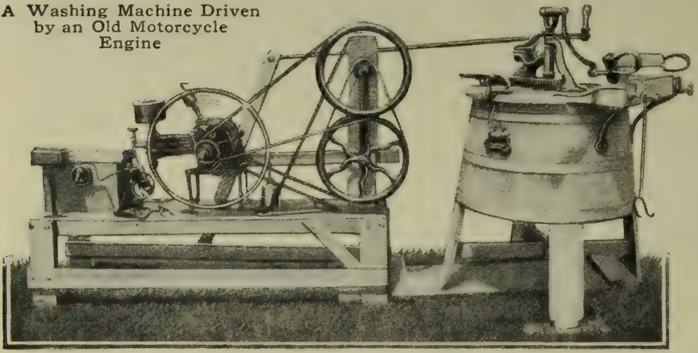
The bucket conveyor in a Chicago power plant is equipped with an ingenious safety control by means of which the movement of the conveyor may be stopped, should trouble occur, without the necessity of running to the main control switch, which might be some distance away, or on another level. In this instance, a safety control is effected by including in the circuit of the holding coil on the automatic motor starter a number of knife switches, located at the principal points of the conveyor travel. Such a switch is located at each turn where buckets are likely to become upset, and others are located at the mid-points of the vertical and horizontal travels.

ℭA Louisville, Ky., business man, who is also something of a statistician, declares that the growing use of the automobile is having a disastrous effect on the millinery business, ladies declining to wear elaborate hats nowadays because they will be torn to pieces by the rush of air met in riding in automobiles.

OLD MOTORCYCLE ENGINE DRIVES WASHER

An interesting power plant for the driving of a washing machine, or other domestic machines of similar nature, is here shown. The power is derived from an old motorcycle engine. The outfit has been in use for more than a year.

A Washing Machine Driven by an Old Motorcycle Engine



SCREEN PROTECTORS FOR OPEN MANHOLES

Every crew of the Commonwealth-Edison Company, working in the downtown section of Chicago, is provided with a screen cover of the same size as the standard manhole cover for protection while at work in the conduits. After the men have gone below, the screen is dropped into place on the sills of the manhole framing. This screen, which consists of $\frac{1}{4}$-in. interwoven steel wire, and is strong enough to bear the weight of a horse, protects both workmen and passers-by from accident, and at the same time admits sufficient air to the underground chamber.

MAKING FERTILIZER BY EXPLOSION

The newest method of obtaining nitrogen from the atmosphere for fertilizers uses gas instead of electricity. A gas which will burn is mixed with air, and when the mixture is lighted an explosion results, and this causes the nitrogen and the oxygen of the air to combine with each other to make a compound which can be absorbed in water, mixed with lime, and sold as a fertilizer. The substance produced is known chemically as calcium nitrate. The best results are obtained from the explosion when the gases are under a pressure of 75 lb. to the square inch, and when oxygen is added to the air, and the mixture is heated before the explosion.

STRANGE FOSTER MOTHER FOR RATS

Following the lead of the California cat described in these pages some months ago, an Ohio cat has taken to nature faking. It inhabits the plant of a paper company of Hamilton, Ohio, and this fall was attracting attention by mothering a family of seven rats. Employes of the plant discovered the unusual combination one day when they went into the cellar. They lifted cat and rats into a basket and have kept them together ever since.

Cat Which Mothered Rats She Found in Factory Cellar

THE WONDERS OF LIGHT

By

J. GORDON OGDEN, Ph. D.

IX — The Rise of Photography

The First Actual Photograph Taken by Man was a Silhouette of a Leaf

FOR all practical purposes, the spectrum of sunlight consists of three parts: that which gives the visible light, extending from the red to the violet, the portion below the red known as the heat spectrum, where the waves are too long to be seen, and the portion beyond the violet, where the waves are too short to be visible. It is upon these latter waves that the art of photography depends. They are the chemists of the ether kingdom, and by their incessant pounding upon different kinds of molecules, they produce such changes as render possible the wonderful portrayal and delineation of the natural world.

The curious property possessed by certain compounds of silver, of darkening under the influence of light, had been observed for many centuries. Man, as usual, was slow to perceive the full meaning of this very suggestive hint from nature, even as he had been slow to understand why his skin turned brown under the influence of the sunlight. It was not until the year 1802 that the first experiments were made from which the art of photography took its rise. In that year, Davy and Wedgewood soaked some paper in a solution of silver nitrate and, after drying it in the dark, placed upon it some leaves and exposed the combination to the sunlight. In a few minutes the paper around the leaves became dark, while the portion under the leaves remained white. This was the first actual photograph ever taken by man. In a few minutes more, of course, the paper became dark all over, as the experimenters knew no way to check the further action of the light on that part of the paper before protected by the leaves.

Nevertheless the door had been opened a little, and the harnessing of the sunlight was, after that, simply a matter of detail to be worked out by patient investigators. Wedgewood wondered whether it would be possible to make pictures of other things besides leaves. Away back in the sixteenth century, an Italian by the name of Porta had observed that when light, say from a landscape, is admitted into a darkened chamber through a tiny hole in the window shutter, a beautiful image of the landscape appears upon the opposite wall of the room.

Wedgewood made a small, light-tight box, the forerunner of the modern camera, placed a piece of his sensitized silver paper in the interior of the box against one side, and admitted light through a small opening in the side opposite to the sensitized paper. Since light travels in straight lines, an image appeared upon the paper. The paper exposed to the image, darkened in proportion to the different light values of the image, and the first landscape "study" had been given to the world. Unfortunately, it was just as fleeting as its predecessor, as neither Wedgewood nor Davy could "fix" the image copied onto the paper by the wonderful fingers of the sunlight. In further experiments they found that by using a small "burning glass," or double-convex lens, instead of the pinhole, they could get much sharper pictures, and get them much more quickly.

Then came Niepce, a Frenchman, who made the next step in photography. He was familiar with the curious fact that asphaltum, the very material which we use nowadays in the making of roadways, was affected in some mysterious way by the action of light. He had learned that this black mineral pitch, or bitumen, would readily dissolve in certain oils, such as turpentine or the oil of lavender, provided it had not been exposed to light. If, for example, he coated a metal plate with a thin film of asphalt, and allowed light of different degrees of intensity to act upon this coating, and then poured oil of lavender over the whole plate, the asphalt had become more or less insoluble; altogether so, where the light had acted with its full intensity, but still quite soluble where the light had acted least. He accordingly prepared such a plate, placed it in a box similar to the one used by Wedgewood, and allowed an image to fall upon it. Now an image is made up of light of varying degrees of intensity. The image reflected from a person, for example, would have strong light from the collar and face, and less light from a black suit. The hands and cuffs would be white, while the shoes would reflect very little light into the camera, as white is an excellent reflector, and black substances absorb most of the light that falls upon them, and reflect but little.

About the Most Difficult Problem for a Camera is Baseball Photography—Notice the Blur of the Bat Which no Camera can Overcome

After Niepce had made the exposure he developed the plate by pouring over it the oil of lavender. The oil dissolved the bitumen that had not been affected by the light of the image, and dissolved in a like manner, in a proportionate way, more or less of the pitch that had been to some extent affected by the light. He therefore obtained a picture made up of varying thicknesses of bitumen, corresponding exactly to the lights and shades in the image. This method is still used in a modified form in the preparation of copper-plate prints, and for certain purposes it is unexcelled.

About the year 1829, Niepce was joined by another Frenchman, Daguerre, who entered with him upon the work of experimentation with great zeal, until the death of Niepce, four years later. Daguerre went on with the problem of photography and one day, by a lucky chance, stumbled upon the one essential thing, the one important link in the chain. He had exposed a plate, sensitized with the iodide of silver. Upon looking at the plate, which had not been exposed long enough to form a visible image, he was discouraged, and carelessly tossed it into an old cupboard filled with chemicals. The next day, happening to come across the plate, he noticed to his great surprise that the discarded plate was quite brilliant with a sharp, clear-cut image in black and white. Immediately he divined that some one or other of the chemicals in the closet was responsible for the development. He then proceeded in a methodical way to learn which chemical had done the work. He exposed plate after plate, placing them one by one in the closet, each time removing one chemical from the shelves. Still the plates developed, even after, as he thought, every chemical had been removed. In great perplexity he was about to give up the idea that the development was due to a chemical, when he happened to notice an old shell containing a few drops of mercury, lying on the floor of the closet. He removed the mercury, tried another plate, and lo, it did not develop. It was the vapor of mercury that had done the work, and the world had learned something new, namely, how to develop a latent image.

This discovery of Daguerre's spread rapidly throughout the world, and soon every laboratory was the theater of photographical experiments. Pessimists deplored the discovery, as they predicted the downfall of portrait painting; but photography had come to stay, and in no wise has it injured the beautiful art of painting, any more than it has that of sculpture.

The first photograph taken by Daguerre's process in America was by Samuel F. B. Morse, the inventor of the telegraph. In 1839, Professor Draper took the first photograph of a human being. It is interesting in these days of rapid photography to review the conditions under which this first photograph was taken. The sitter for this counterfeit representation of the human countenance, had her face covered with flour, her head tightly clamped between iron rods, and sat in the full glare of the sunlight on the roof of Columbia University for 25 long minutes, facing a camera whose lens was 5 in. in diameter. The torture to which the sitter was subjected and the agonized look revealed by the photograph, are mute evidences that having one's picture "took," 70 years ago, was quite a serious operation.

Then came the discovery that the use of bromide of silver would give quicker results than the iodide. The time was then shortened to two minutes. Imagine how long those two minutes must have appeared to a sitter in those days, when we of the twentieth century have great difficulty in sitting still for the same number of seconds! In 1841, the invention of the Voigtlander lens cut down the time of exposure still more.

The First Photograph of a Person was Taken by Professor Draper, of a Woman Who Sat in the Sunshine on a Roof for 25 Minutes

The old Daguerre process meant only one picture for each sitting, and it was not customary for people in the pioneer days of photography to coolly order a dozen or two of photographs, as that meant just that many sittings. Each picture was a "positive," and was taken home. The photographer had no "negative" from which he could reproduce a thousand or more, as he does today. And yet those old daguerreotypes were wonderful pictures, and compare quite favorably, in detail and artistic merit, with the best work of today.

The next important discovery was that of Fox-Talbot, an Englishman, who showed the world how to make "negatives," from which any number of photographic copies, or "positives" might be made. These negatives were made on paper. In 1851, Niepce de St. Victor, appreciating the difficulties of printing through paper, used glass plates coated with the bromide of silver and albumen. This was the first use of glass plates in photography. Collodion, a solution of guncotton, was next used as a substitute for albumen.

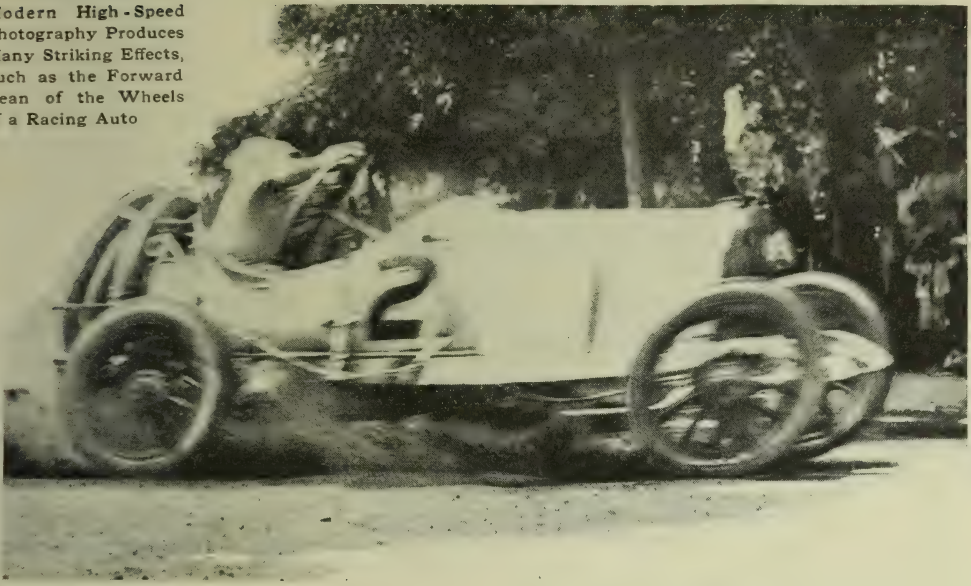
The great disadvantage of the various methods at this time was the fact that the plates had to be wet, and although the "wet-plate" process produces beautiful results, it was a great handicap to the availability, under all conditions, of the photographer's art, and only experts could produce good results. Finally, Doctor Taupenot coated a plate with albumen, dipped it into a solution of silver nitrate, and dried it. The first dry plate, now so commonly used, had arrived. It was only one-sixth as sensitive as the old wet plate, but it was a forward step, eliminating the disagreeable features of the older process. In 1871, Doctor Maddox substituted gelatine for collodion. The dry plate now consisted of an emulsion of bromide of silver and gelatine. The next improvement was the use of thin films of celluloid instead of glass plates, making possible the marvelous advances of the last 30 years in the field of photographic application.

A few words concerning the chemistry of photography may possibly be of interest. Light waves have the power of "reducing" certain chemical salts. To "reduce" means to take something from something else. Bromide of silver, for example, is made up of silver and bromine. When the image falls upon the emulsion of silver bromide, the light breaks up the combination between the silver and bromine, and sets the silver free in its metallic form, in exact proportion to the intensity of the light in the different parts of the image. If the plate in which such change has taken place is looked at by means of a ruby-colored light, it does not seem to have been affected at all, as the image is "latent." The plate is then placed in a "developing" solution, which simply continues what the light started, and makes a further reduction, depositing pure silver which is (in fine deposits) perfectly black, on the parts of the plate where the action of the light was strongest. It has no effect on the parts of the plate where the light had not acted. The plate is now a mixture of pure silver, partially reduced silver, and silver bromide. It is then placed in a bath of hyposulphite of sodium, commonly called "hypo." This substance has no effect upon the reduced silver, but will dissolve silver bromide. A negative is thus produced of varying thicknesses of silver, heavier where the light action was stronger, thinner where it was weaker, and absolutely none where the light had not acted at all, as in the densest shadows in the image. This negative, after it has been thoroughly washed and dried, is then placed over a bit of sensitized paper in a suitable printing frame, is exposed to the sunlight, and a "positive" is thus made, by the light filtering through the different thicknesses of the silver deposit, and exactly reversing the relative proportions of black and white in the negative.

Wonderful indeed has been the advance of photography since Scheele, in 1777, noticed the darkening effect of sunlight on silver chloride. Wonderful has been the development of the apparatus used in the art. The modern lens, for example, is a triumph of scientific accuracy, and, we might add, of complexity. Practically all the problems of spherical and chromatic aberration, and of astigmatism, have been solved by the lens makers, and a first-class photographic lens, made up of glass of different densities and curvatures, may be bought at any optician's.

In the earliest days of photography it took three hours to "take a picture." Nowadays it can be done in less than the one-thousandth of a second—just about eleven millions times as fast! The world has certainly moved on.

There is one phase of photography, however, that has not been improved upon. The first camera picture was made with a "pinhole" opening in place of a lens, and, after all, pinhole photography, or "lensless" photography, as it should be termed, has never been excelled, in certain respects.



Modern High-Speed Photography Produces Many Striking Effects, Such as the Forward Lean of the Wheels of a Racing Auto

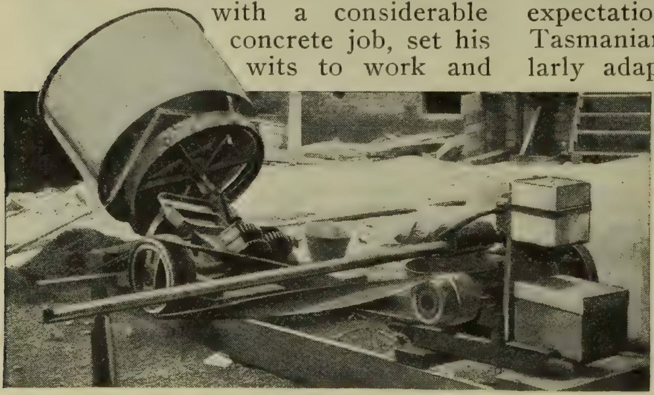
The principle underlying lensless photography is that which underlies all photography, viz., the fact that light travels in straight lines. Each ray carries a tiny picture of whatever reflected it through the pinhole to the sensitive emulsion on plate or film. The smaller the opening the fewer will be the number of rays from each point.

The apparatus needed is simply a light-tight box of any description, a box of fast plates, a plate holder (even that may be dispensed with), and a pinhole opening in the side of the box, directly opposite to the sensitive plate. With this equipment the amateur may go forth and secure truer, better-balanced, and more artistic pictures than he can with the best lens ever created in laboratory or workshop. Lenses exaggerate. The shadows are always blacker than nature makes them. The perspective is faulty as it is more or less distorted, and far and near objects are not taken equally. A lens simply works faster than a pinhole, owing to the relatively larger amount of light transmitted through the wider opening of a lens. A lens is designed to cover a certain size plate, such as 4 by 5, 5 by 7, 8 by 10 in., etc. It cannot be used efficiently for a plate larger than that for which it was intended. The pinhole will cover any size plate, even if it were as large as the wall of a room. A lens will not include more than a comparatively small angle, while a pinhole will give an angle of about 170 deg. A lens takes a hard, sharp picture. A pinhole copies a landscape just as one sees it in nature, and by no other means can such exquisite softness and shading be produced. With a pinhole there is no necessity for "focusing," as the image is always in focus. There is also practically no danger of the spreading of light.

It is always ready, never has to be polished to keep it free from dust and dirt, and does not cost anything to make. Of course, one may be particular and secure the mathematically round holes bored in thin sheet metal, to be purchased at any photographic-supply house, but for ordinary work a bit of thin, opaque paper, and a fine needle, are all that is required.

No phase of photographic work is more delightful, and no investment will pay a higher rate of interest than will the time and preparation required for lensless photography.

HOMEMADE CONCRETE MIXER



Homemade Concrete Mixer Which Utilizes Parts of Discarded Mowing Machine

A mechanically inclined young man of Etna Green, Ind., being confronted with a considerable concrete job, set his wits to work and constructed the unique but practical mixer shown in the accompanying illustration. The mixer consists of a metal receptacle mounted on the "bull wheel" of a discarded mowing machine. This wheel was set at an angle and the gears of the mowing machine were also utilized as part of the transmission. The outfit was connected by belt with a gasoline engine, and accomplishes thoroughly the work of several men.

PAPER FROM TASMANIAN BLUE-GUM TREE

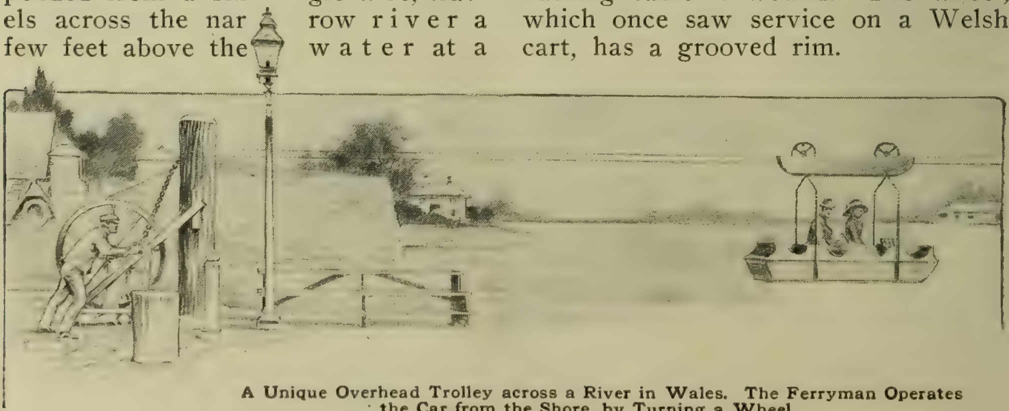
Extensive experiments, recently made in England, show, contrary to expectations, that the wood of the Tasmanian blue-gum tree is particularly adapted to the manufacture of the heavier and better grades of paper, and a plant, capitalized at more than a million dollars, is to be erected in Tasmania.

The Tasmanian blue gum, which grows extensively in California and Australia, as well as in Tasmania, has the most rapid growth of any tree in the world. It is not killed when cut down, but grows up again, reaching a height of 50 ft., or more, in four or five years.

Until a few years ago, this tree was considered worthless in California, except for fence posts or for fuel, but of late, owing to the beautiful finish it takes, it has come into use for interior woodwork in fine buildings and residences. Its possibilities as a material for the manufacture of paper are most important.

A HAND-OPERATED TROLLEY FERRY

Crossing the Aeron River at Aberaeron, in Wales, is a unique overhead ferry. The little four-seated car, suspended from a single wire, travels across the narrow river a few feet above the water at a speed approximating 20 miles an hour, the power being provided by the ferryman turning a wheel over which the hauling cable is wound. The wheel, which once saw service on a Welsh cart, has a grooved rim.



A Unique Overhead Trolley across a River in Wales. The Ferryman Operates the Car from the Shore, by Turning a Wheel

MODELS TO PROVE SOIL-EROSION DANGERS

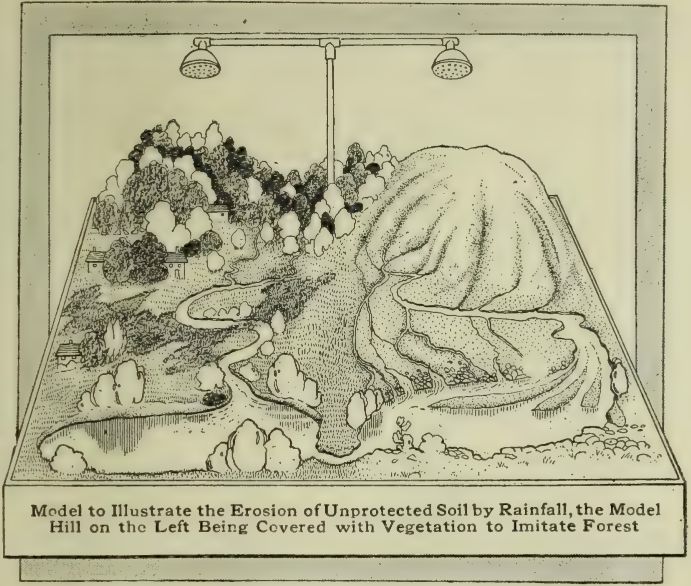
By L. WILLIAM THAVIS

Uncle Sam has a new nature study. Through the use of miniature models in the office of experiment stations of the Department of Agriculture he determines the annual loss through erosion of hillsides and the vast destruction of farms in the lower valleys following removal of forests. It is proposed that similar working models be placed in the schools of the country for the use of classes in nature study, elementary agriculture and physical geography.

The model consists of two hills sloping down into two valleys through which two streams wind in and out through farm land and lead into two lakes at the front of the landscape. Both hills are made of the same soil, that of the region in which the model is erected, but one is covered thickly with twigs, young trees, or shrubs to simulate a forest, underneath which is a heavy carpet of moss representing the layer of leaves and twigs which covers the ground in the real forest, while the other hill is bare of all vegetation.

By means of a suitable sprinkling device water is made to fall like rain with equal force upon the two hills. On the forested slope its fall is broken by the foliage and it drops gently upon the moss-covered surface of the ground. The moss and soil beneath, which are kept soft and porous by the protective cover, quickly absorb the rain and allow it to seep out as clear water farther down the slope, thus forming a mountain stream which flows through a green and fertile valley into a clear lake at the lower end of the model.

On the other slope the rain beating down upon the unprotected and hardened surface washes deep gullies in the hillside, carries the soil into the turbid stream which drains the valley below, and thence into a muddy lake. The erosion on the slope loosens stones, which are carried down upon the valley farms; the silt deposited in the channel of the stream diverts the water, which opens up gullies through the dry land; the main stream is made shallower and wider and often overflows into the fields; islands and silt bars rise in the stream; and deltas are built up in characteristic form at the entrance to the lake.



Model to Illustrate the Erosion of Unprotected Soil by Rainfall, the Model Hill on the Left Being Covered with Vegetation to Imitate Forest

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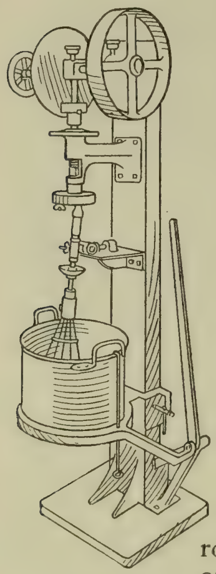
ℂLieutenant Conneau of the French navy, who is known in aviation circles as André Beaumont, astonished Paris recently by making a trip over the city, following the course of the river Seine and varying the monotony of ordinary travel by alternately ducking under and flying over bridges with his hydroaeroplane.

ELECTRICALLY OPERATED BATTER-MIXER



An ingenious batter beater, electrically operated, is shown in the accompanying illustration. The motor operates a vertically placed friction disk against which a wheel on the vertical shaft slides, thus giving the latter a rotary motion. At the lower end of the shaft is a horizontal disk provided with several perforations at varying distances from its center, into which the handle of the beater proper is inserted. At a lower point the handle is fulcrumed in a universal joint, thus giving the beater a rotary shake. Changes of speed are attained in the same way as in any other friction drive.

If the handle of the beater proper is fixed in the central hole of the horizontal disk, thick batter is obtained. If near the periphery, a thinner consistency is the result.

NOVEL MOTORCYCLE TUBES

English motorcyclists are trying out an innovation in inner tubes. Instead of the old method of laying the ends of the tubes over each other in the outer casing, they are now slipping one end into the other, somewhat on the principle of a valve. Dome ends are supplied which can be cemented to the ends of any motorcycle tube. One of these dome ends, made of a somewhat thicker rubber than the tube itself, is closed and shaped like a dome. It slides into the other end of the tube and a string is tied about its neck just below the dome. When the tire is inflated, the dome flattens and prevents leakage. It is claimed for these dome ends that they obviate the rubbing of the two ends of the tube which were overlapped in the former method of placing them in the outer casing.

PUMPS WATER BY MEANS OF GEAR TEETH

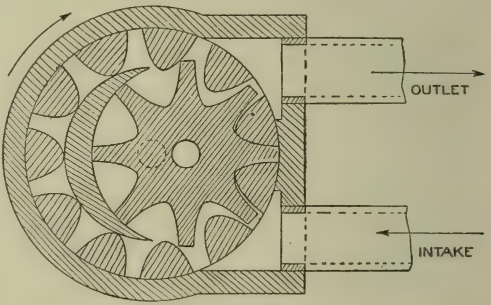
At the Iowa State College a new and simple rotary pump has recently been put through thorough tests which showed it to be of great efficiency.

This pump has only two moving parts; an outside annular gear and an inside spur gear. The main shaft extends through the back of the pump, carrying a driving pulley on its outer end and connecting with the large gear. It is the only part that requires packing.

The spur gear is mounted on a stud opposite the large gear. There is a crescent-shaped projection dividing the space between the two gears. By reversing the direction of rotation the intake pipe may be used as an outlet.

When the water enters the pump, it is carried around by the pockets formed by the teeth in the large gear and the crescent-shaped projection. As it reaches the outlet port the two gears come into mesh on the upper side and force it out.

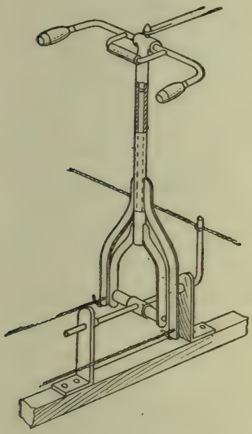
Tests have been made at speeds varying from 200 to 450 revolutions per minute with heads of from 30 to 150 ft. The highest efficiency was reached at 400 revolutions per minute and was 76.3 per cent. The discharge of water per revolution was about the same at all stages of effi-



Sectional View of Efficient Rotary Pump

ciency. At the highest it was about ¼ gal., after deducting leakage. The pump has been successfully used in a stone quarry drawing water which was mixed with mud and fine gravel.

A BICYCLE-HANDLE CONTROL FOR AEROPLANES

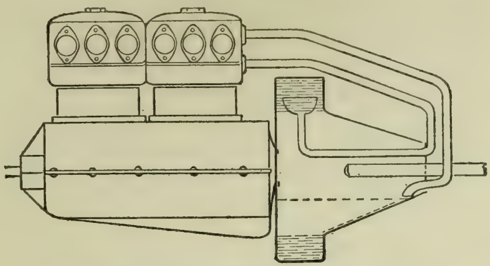


Believing that an airman who has previously learned to ride a bicycle or motorcycle will have nothing to unlearn and will be better able to maintain lateral and longitudinal balance if he has a control on his aeroplane that corresponds to the action of a bicycle handlebar, a Boston inventor has designed such a control.

The handlebar of this novel control is capable of three kinds of movement. Both handles may be pushed forward or aft, and to left or right, while the turning of the handlebar one way or the other moves the vertical rudder. Drawing back the bar elevates the machine, pushing it forward depresses it, pushing it to the left elevates the right wing, and pushing it to the right elevates the left wing.

PLACING THE RADIATOR IN THE FLYWHEEL

A Roumanian engineer has devised a radiator for automobile engines which is located in the flywheel. The flywheel is cast hollow with a tapering projection on the front. Pipes leading to and from the water jacket are connected up to a funnel attachment surrounding the flywheel. One of these pipes discharges water into the bottom side of the funnel, the flywheel catches and carries the water around, and the second pipe, provided with a flared end, collects the water distributed around the hollow channel of the flywheel by its motion and returns it to the jacket. The water trickling into the funnel from the first mentioned pipe is said to be reduced to the proper temperature for return to the jacket by the cooling effects of the air movement set up by the whirling of the flywheel.



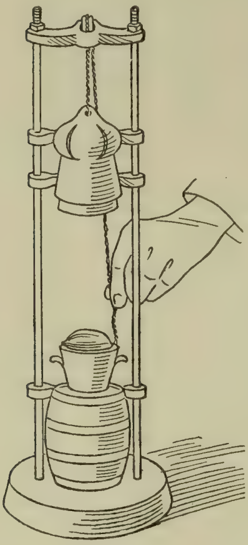
Automobile-Engine Radiator Designed to be Placed in the Flywheel

TROLLEY FEEDING DISH FOR BIRDS

A novel idea in feeding devices for wild birds is shown in the accompanying illustration. A shallow bowl, containing birdseed, bread crumbs, or the like, is suspended from a clothesline, and the birds perch upon its rim and sway in the air as they feed. Lighter lines may be attached to the bowl swing for the purpose of drawing it up to the end of the line for refilling with food.

ℭThe first theft of an aeroplane was reported recently from Munich, Bavaria, when Herr Belat, an airman, discovered his hangar had been entered and a monoplane belonging to him had been stolen during the early hours of the morning.

PILE-DRIVER NUTCRACKER

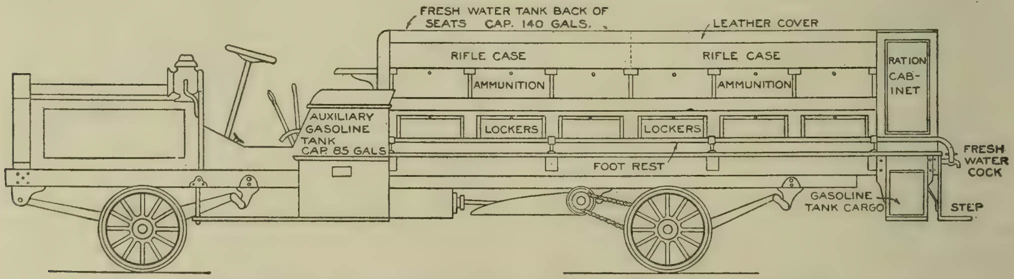


A nutcracker which seems more of a novelty than a practical implement for cracking purposes is being marketed abroad. It takes the form of a pile driver, and may be procured in silver as well as in the baser metals. Upon a keglike base is mounted a holder in which the nut is placed. Then the "pile driver" hammer is raised to the top of the frame by pulling a string and allowed to drop, the force of the blow being calculated to crack the shell.

MOTOR TRUCK DESIGNED FOR U. S. ARMY

Designs for a gasoline-propelled motor truck for military service exclusively have been drawn by Maj. H. J. Gallagher, of Seattle, and are now in the office of the Department of War at Washington for consideration. Many features are included which recommend it as a means of transporting troops, guns and ammunition.

The gasoline tank of the military car has a capacity of 80 gal., which gives the machine a traveling radius of 400 miles, while a reserve gasoline tank can be conveniently carried. A tank for drinking water for the soldiers is included in the equipment. The locker spaces for ammunition, rifles, clothing, and the like, are indicated in the drawing. The ration cabinet has a capacity of three days' rations for 14 men. Space for the carrying of shelter tents and other equipment is also provided.



A Military Automobile for Transportation of Men, Guns, Ammunition, and Camp Equipment

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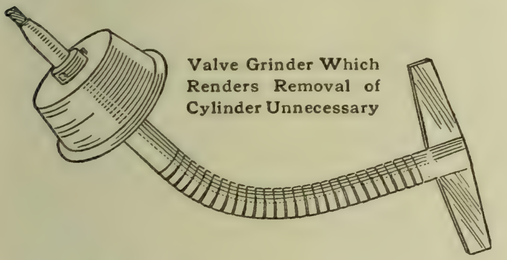
"HYDRO-AEROPLANE" IS A PUZZLING DESIGNATION

The success of the pontoon or float-equipped aeroplanes in alighting on, rising from, and running on the water, is causing, according to L'Aéro, Paris, increasing protests against the abominable appellation "hydro-aeroplane." This journal proposes "air-hydroplane" instead of hydro-aeroplane, as not less clumsy, perhaps, but easier to pronounce and more logical, since the air indisputably has a better right than the water to the first place in the name.

Aside from the viewpoint of L'Aéro, it is quite evident that the term "hydro-aeroplane" is more or less confusing to the general public. In the first place, a hydroplane is a boat, in most instances a motorboat, having its bottom constructed as a series of two or more steps, upon which it planes when driven at a high speed. The hydro-aeroplane started out to be a boat having aeroplane wings and an aerial propeller attached above it to lift it almost wholly out of the water when running at a high rate of speed. One or two types, built a year or two ago, were lifted completely out of the water by this means, but were never intended to rise any more than two or three feet above the water's surface. Then Glenn Curtiss began experimenting with regulation aeroplanes equipped with pontoons for rising from and alighting on the water, and the success of the idea both in America and abroad has resulted in this type of machine becoming known as a "hydro-aeroplane."

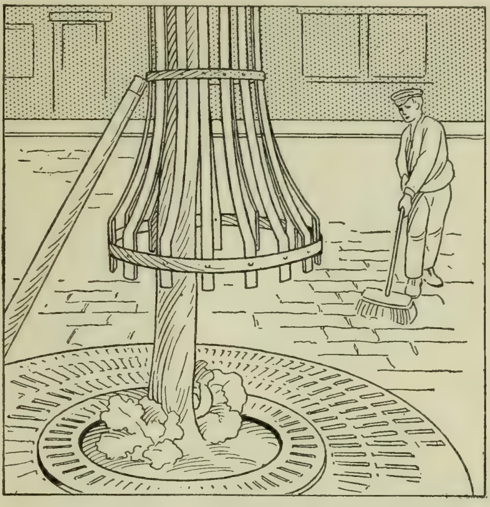
VALVE GRINDING IN PLACES DIFFICULT OF ACCESS

Valves not easily accessible by ordinary means may be ground without difficulty with the valve grinder, an English invention, shown in the accompanying illustration. In employing this grinder, removal of the cylinder is unnecessary. Provision is made by the tapered thread of the imitation valve cap to fit any valve-cap opening. This part of the device is recessed and drilled to permit a small quantity of the mixture used for grinding to drop slowly on the lip of the valve. A flexible casing passes through the center, within which is a shaft, fitted at the end with a screwdriver head. This engages with the head of the valve and is held in place by a spring. A handle is provided at the other end which, by turning to and fro, twists the valve backward and forward and thus grinds it. A light spring is placed under the valve head which raises the valve from its position following a pull on the handle and permits further moistening of the lip by the grinding mixture.


Valve Grinder Which Renders Removal of Cylinder Unnecessary

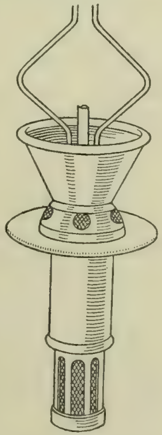
CABBAGE PATCH ON A PARIS BOULEVARD

A street sweeper is credited with having an absolutely unique truck garden in Paris. In the tiny patch of earth at the foot of one of the trees adorning the pavement which it is his duty to keep clean he grows cabbages and lettuce.


A Unique Truck Garden in Paris

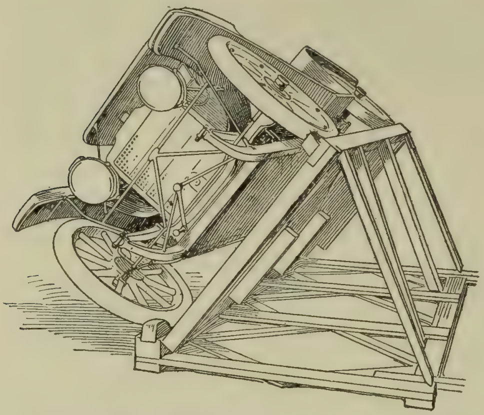
COMBINED GASOLINE FILTER AND FUNNEL

A combined filter-funnel for gasoline has been introduced to the English trade by an American department store in London. The device, shown in the accompanying illustration, combines a funnel with a filter of fine wire gauze, and by its use foreign matter is excluded from the automobile tank. It is superior to some other funnels in that there is no waste of gasoline, as the supply can rests on the funnel during the operation of filling the tank and there is therefore no occasion for holding it in position.



DEMONSTRATING LATERAL STABILITY

The non-upsetting quality of a make of automobile constructed on the underslung system is being demonstrated in the manner shown in the accompanying illustration. The car is tilted on the rack at an angle of 55 deg., or, to put it more simply, the car is tilted 4 ft., without upsetting. The underslung body means, of course, a very low center of gravity, which tends to keep the machine from turning turtle if it runs into a ditch, or in like emergencies.



Demonstrating That a Certain Make of Automobile is Not Likely to Turn Turtle

HYDROELECTRIC AND SEWAGE DISPOSAL COMBINATION

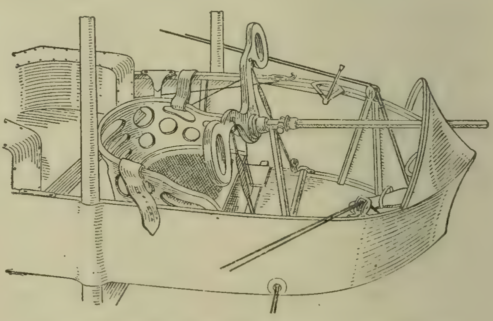
A sewage-disposal tunnel that would also provide water power for a hydroelectric plant, thus providing illumination for the cities in question, as well as solving the sewage-disposal problem, is suggested by J. J. Knapp, head of the commission appointed by the municipalities of Buffalo, Tonawanda, North Tonawanda, Lackawanna, Lockport and Niagara Falls.

The sewage from all these cities is daily flowing into the Niagara River and over the falls. It is from this river that the inhabitants of these cities, with the exception of Buffalo and Lackawanna, which receive their drinking water from Lake Erie, draw their water supply. The most feasible solution of the sewage problem, according to J. J. Knapp, is to build a sewage tunnel from Buffalo down the river and through the Tonawandas and Lockport to the escarpment at Lewiston, where a disposal plant could be erected. This disposal station would reduce the sewage to fertilizer, after which it could be put back on the land. The water would be returned to Lake Ontario, which is below the falls, 95 per cent purer than before it entered the disposal tank. Also, as there is a fall of 250 ft. between Buffalo and Lewiston, the flow of water in the sewage tunnel would be very rapid, and a hydroelectric plant could be located near the disposal station to provide power.

NEW FARMAN BIPLANE CAN RUN HALF SPEED

Maurice Farman, the French airman and aeroplane builder, has brought out a new biplane, the distinguishing feature of which is that the control is so simplified and so accurate that the machine can glide at half speed without becoming "unseaworthy."

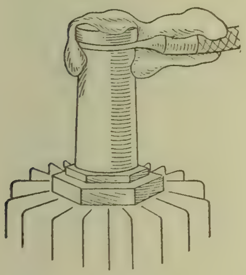
This biplane is a passenger machine and weighs about 1,700 lb. when in flight. Its ordinary speed is 56 miles an hour, but by the simplified controlling device the pilot has a variation of speed at his command. In recent tests, the machine ascended during a high wind when others were forced to remain on the earth, and at a height of about 1,000 ft., the pilot shut his throt-



Controls and Seating Accommodations of New Farman Biplane tle down to half-speed and the propeller could be seen to slacken. Yet the machine did not drop at all but glided along in a semicircle for half a mile, remaining perfectly stable. The rudder alone was used. It is said of this machine that it answers its controls as quickly as a monoplane.

The aeroplane has a span of 51 ft. 8 in. and is 49 ft. 9 in. long. Without the pilot, oil or gasoline, it weighs 1,250 lb. A 70-hp. air-cooled 8-cyl. engine placed behind the passenger's seat is the motive power, and is so securely lashed that it will not come loose except in a fatal fall. Most of the spars and tail booms are hollow. There are many other smaller improvements, such as a sector arm at the aileron-control lever to take up slack in the cable, and guides to keep the aileron-operating wires in their pulleys.

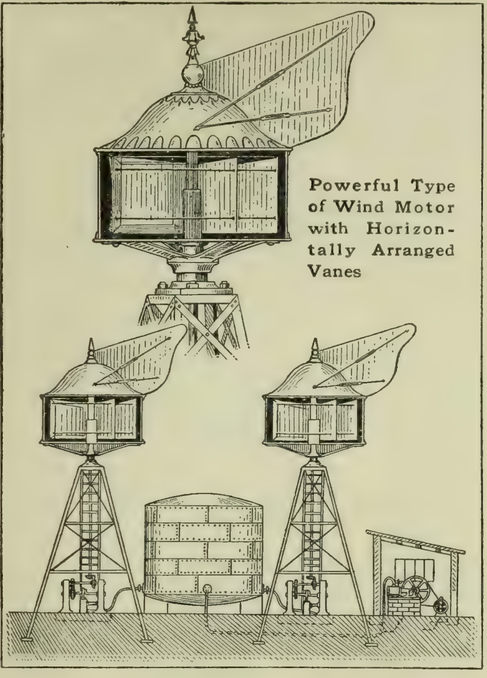
RUBBER DOUGH WATERPROOFS SPARK PLUG



A motorcyclist, who was often inconvenienced by having his motor stopped through the effect of rain on the spark plug, has found that the danger of such short-circuiting can be avoided by the use of rubber dough. In wet weather he covered the end of the wire and the top of the spark plug with a liberal chunk of the rubber dough used to fill cuts in tires. This hardens with exposure to the air and forms a perfectly waterproof cap.

HORIZONTALLY ARRANGED WINDMILL VANES

The feature of this wind motor is in the horizontal arrangement of the vanes in a semicylindrical hood, which is caused to turn freely by the wind pressure on its tail, thus exposing to the force of the wind only those vanes that do not move against the wind. The shaft of the hood, as well as that of the propeller, is mounted on roller bearings. The design of the apparatus permits of such strong construction that it may be made of great size, with a proportional increase in power.



Powerful Type of Wind Motor with Horizontally Arranged Vanes

HYDROELECTRIC PLANT WITHIN POLAR CIRCLE

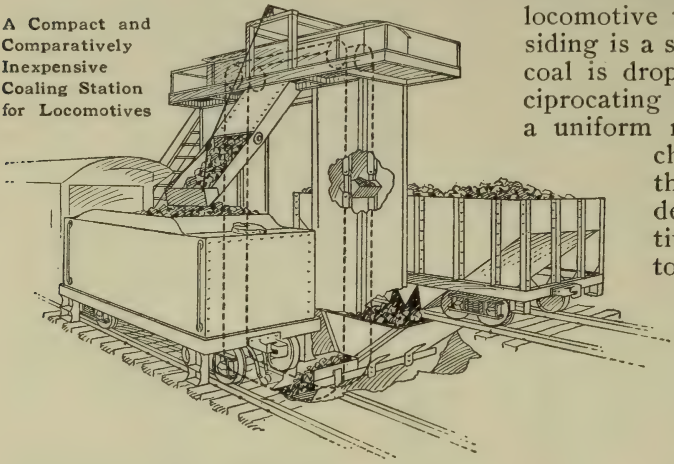
Some 100 miles north of the Polar Circle the Swedish government is to build a powerful hydroelectric plant to provide power for the electrification of a railroad. The plant is to be located on the Lule River at Porjus, in Lapland. The total height of the fall of water is about 164 ft., and the total available power of the fall at low-water level is at least 145,000 hp. By building the dam 3,280 ft. long and about 165 ft. high it is believed that 300,000 hp. can ultimately be gained.

The cost of the plant and the electrification of the railroad will be about $9,000,000. Only 37,500 hp. of the available power of the fall is to be utilized by the plant at present projected.

LOCOMOTIVE COALING STATION

A compact locomotive coaling station of low cost is shown in the accompanying illustration. The structure is of steel, 6 by 16 ft. in size, and stands between a car siding and the locomotive track. Under the coal-car siding is a steel hopper into which the coal is dropped from the car. A reciprocating feeder delivers the coal at a uniform rate to an endless bucket chain, and the buckets lift the coal to a chute which delivers it into the locomotive tender at the rate of a ton per minute.

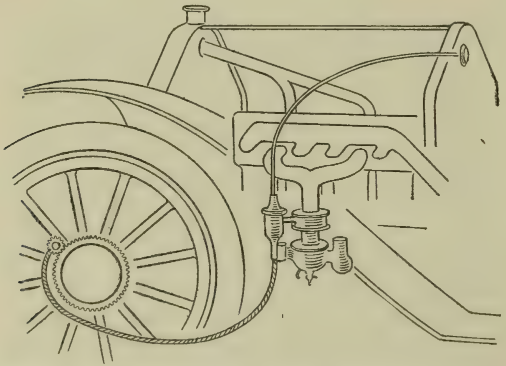
The machine has been so constructed that it can be operated by an electric motor taking power from a central station, or by a gasoline engine.



A Compact and Comparatively Inexpensive Coaling Station for Locomotives

SPEED CONTROLLER ON NEW THEORY

Commercial-car owners will be interested in a new governor which prohibits the chauffeur from speeding and yet enables him to get the full power out of his engine on a bad hill. This governor has no effect on the motor so long as it runs below the maximum speed and does not affect the number of shaft revolutions per minute. The device, which is driven from the front wheels like a speed indicator and operates an auxiliary throttle of the butterfly type, is mounted between the carburetor and the intake manifold. The motor can be speeded up for a hard pull as long as the car itself does not exceed the maximum speed.



Motor-Car Speed Controller Operating from Wheel Hub

CORK-COATED FABRIC FOR BALLOONS

A German manufacturer has brought out a new balloon fabric having a layer of pulverized cork on its inner side as a means of overcoming the inconvenience and dangers incident upon the heat of the sun's rays.

He claims that the exceptionally low heat conductivity of cork will prevent the sudden fluctuations of heat in the surrounding atmosphere from penetrating to the gas inclosed by an envelope of such fabric. The cork is firmly incorporated with the rubberized balloon fabric by means of a vulcanization process.

ℭAn association has been founded in London for the purpose of protecting and promoting the interests of British engineers in foreign countries.

THE MYSTERY OF CELLULOSE

By DANIEL M. GROSH

IN no branch of industrial chemistry are the opportunities so great for the investigator to achieve professional and financial success as the investigation of cellulose, which is the substance forming the framework of plants. The developments of the past are but an iota compared with what is promised for the future, the field being practically inexhaustible.

This mysterious and least known substance, as far as the raw material is concerned, is both chemically and physically paradoxical to the extreme; and with all its prominence and use, we know no more about it than we ever did. Each question solved brings up a new one and the deeper one penetrates the more complex the mystery becomes.

In cellulose we have one of the commonest and most abundant of organic products, comprising, when free from moisture, one-third of all the vegetable matter in the world. We know it grows under the influence of sun and air but how it is built up is unknown. Its actual molecule is also unknown and we only know it is composed of carbon, hydrogen, and oxygen. The chemist can make thousands of other organic compounds, knows and can combine the atoms without vital energy, such as camphor and indigo, but stops short at the synthesis of cellulose.

As each small morsel of information has been gleaned it has been adapted to industrial use, and millions have been spent and thousands employed in the industries it has created.

The properties of cellulose which make it so adaptable for industrial use are its inertness, freedom from decay, and resistance to the disintegrating influence of air and moisture. The most important industries dependent on cellulose are paper, cotton, linen, rope and twine. The paper mills depend upon the forests for it in the form of wood pulp, which contains impurities that must be removed by chemical agents. Wood pulp may decay and is not so strong as cotton, but chemically they are identical and the chemist who can discover how to make it instead of taking it from plants or how to make the wood variety equal to cotton in strength and durability, will have his fortune assured.

The purification of wood pulp was one of the most valuable chemical discoveries of modern times in industrial value. The wood chips are digested in bisulphite of lime and free sulphurous acid, which destroys all but the cellulose, which after bleaching is pure and ready for use.

Fifty per cent of the wood goes to waste and is waiting for the chemist to utilize and turn it into a source of revenue. Other opportunities for the chemist are improvements in the sizing and ink-resisting qualities, the waterproofing of paper and the practice of loading with foreign materials to alter the appearance.

In the cotton industry, one of the great chemical achievements is the mercerizing of cotton. This was known for 30 years before it was utilized commercially and is based on the fact that if a piece of cotton (pure cellulose) is placed in caustic soda, it shrinks 20 per cent but becomes 50 per cent stronger and takes dye better. If fixed so it cannot shrink, it takes on a silken luster. Any chemical discovery connected with cotton is bound to be important. In dyeing cotton the question arises why some dyes will take and others will not, thus requiring what is called a mordant, some basic mineral salt with which the cotton will combine. The cellulose holds to the mordant and the mordant to the dye. Eventually the chemist will prepare cellulose to hold the dye directly without the injurious mordant, or discover a dye with an affinity for cotton.

Linen is also pure cellulose and a fortune is waiting the chemist who discovers an improved way of separating the flax fibers other than by soaking in water. In the plant world there are 110,000 flowering species, the stems all differing, and yet, all told, the industries of the world use only about 25 varieties. The chemist certainly has an unlimited source, and infinite possibilities to work upon.

Cellulose dissolves in a solution of zinc chloride into a sticky syrupy fluid and when formed into threads and carbonized, makes filaments for incandescent lamps, and paper soaked in this solution is made into fiber utensils. It also dissolves in ammoniacal cupric oxide and fabrics coated with this become waterproof and very resistant. Under certain treatment with acetic acid it forms excellent insulation for electric wires.

Concentrated sulphuric acid breaks cellulose into grape sugar, a process awaiting commercializing by the chemist as well as a method to transform the grape sugar formed into alcohol, both sure to be exploited especially in the way of by-products. Nitric acid and cellulose (cotton) forms gun cotton, which is stepped down into cordite and smokeless powders.

The curious fact that the lower cellulose nitrates are soluble in camphor, is the basis of the production of celluloid, of which the United States makes $5,000,000 worth annually. These same cellulose nitrates dissolved in ether and alcohol instead of camphor produce collodion, so useful in pharmacy, photography and surgery.

One of the great triumphs of cellulose is artificial silk. Collodion is formed into fine threads and solidified, having reverted back to cellulose, chemically identical with cotton, but with all the appearance and luster of silk. Several methods are used but all depend upon the final resolution back to cellulose. Europe produces annually many times as much artificial silk as it does natural silk. A tree in the forest is worth $10 a ton, but spun into silk, $5,500 per ton. At every turn a mine of financial reward awaits the chemist who can improve on the present methods as well as discover new processes and substances. The outer edge of this wondrous and mysterious field has only been touched.

Cellulose has also many unexplained properties, for example, it is extremely sensitive to light within certain limits. Certain chemicals are but slowly affected by light but when placed upon cellulose paper, the paper is instantly decomposed by sunlight, being analogous to positive printing. Other chemicals may also have peculiar properties in this connection and a new photographic art will no doubt be evolved.

Under certain conditions cellulose is a conductor of electricity and latent possibilities exist in this connection, one of which may perhaps result in electrical printing, direct from type or plates without the use of press or ink, as the following experiment shows. If a coin is attached to the positive pole of a battery and a sheet of moist paper to the negative pole, the paper shows the image of the coin after certain treatment. If the poles are reversed, the image is not apparent but can be produced after a long period by treatment with a silver salt.

The synthesis of cellulose must surely come, as certain enzymes or ferments are able to react with it, which it does in the digestive organs of animals, and it is spontaneously formed in the sugar-beet juice by certain other enzymes. Here we have the natural resolution and synthesis, and likewise certain microbes can produce it from grape sugar.

It is to be hoped the American chemist will be responsible for future development of and discoveries concerning cellulose. Surely the rewards will be ample and mankind benefited as in the past. Foreign investigators have taken the initiative heretofore in industrial chemistry. We have the talent, the equipment and facilities; but have we encouragement or moral and financial assistance from the interests most directly concerned?

¶George Thompson, a Denver airman, was killed at Lemar, Col., when his machine hit a tree.

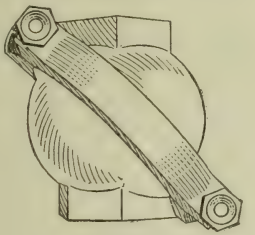
TRANSPARENCY OF METALS AT HIGH TEMPERATURES

Gold leaf of a thickness of four millionths of an inch will, in a cold state, allow the green rays of light to pass through, but this is the only example of light penetrability among metals in a cold state.

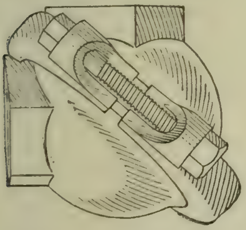
Recently, however, European scientists have turned their attention to the fact, discovered by Faraday, that gold and silver foil become transparent if heated. Thus it has been found that at about 1,000 deg. F. gold foil somewhat thinner than that mentioned above becomes completely transparent to white light, while a very thin film of silver placed on a glass plate becomes transparent at about 740 deg. F., the combination of silver and glass no longer acting as a mirror.

Several other metals have been found to possess the same property when intensely heated, but aluminum, despite its lightness, has so far proven impenetrable by light.

AN ADJUSTABLE ANGLE UNION

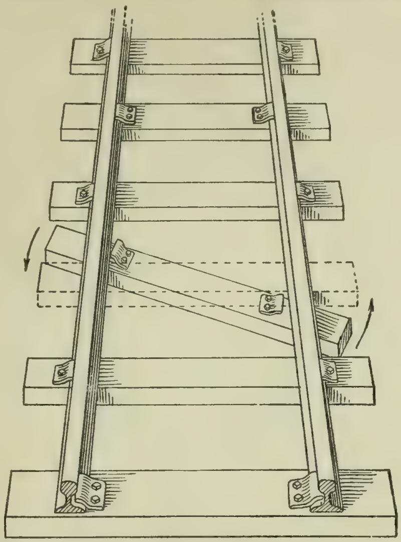


An interesting union, the connecting part in pipe lines, having a joint which is ground so perfectly that it requires no gasket, and which takes the place of the elbow as well as the ordinary union is being manufactured in Detroit. It is easily adjustable at any required angle, and, on account of the liberal area, friction is reduced to a minimum regardless of the angle. The illustrations show it as a straight-way union and at an angle of 90 degrees.



THE LAYING OF TEMPORARY RAILWAYS

The work of laying and removing temporary railways, such as are used in mines, is made considerably easier by the new rail fasteners recently designed in Germany.

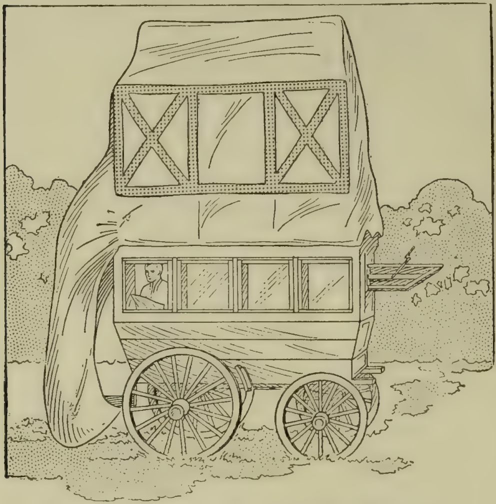


A System of Inside and Outside Clamps Used in Laying Temporary Track

Every other sleeper is provided with inside clamps, spaced the proper distance apart and fastened down with two screws. The remaining sleepers are provided with outside clamps, so spaced as to tightly clutch the outside flange of the rail. In laying the track, the sleepers provided with outside clamps are laid out straight across the roadbed, while the sleepers provided with inside clamps are placed at the angle at which one is shown in the illustration. The rails are then fitted under the outside clamps, and the sleepers having the inside clamps, and laid at an angle, are driven parallel with the other sleepers. Thus the knocking into or out of a crosswise position of the sleepers having the inside clamps, quickly fastens the rails solidly in position, or allows the track to be quickly taken up. Under test in important German coal-mining districts railways of this construction were found to be generally satisfactory.

OLD OMNIBUSES AS HOLIDAY HOMES

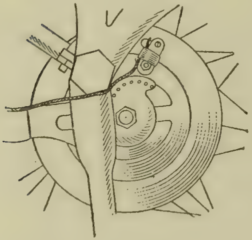
An enterprising individual in London recently purchased a number of the old horse-drawn omnibuses, discarded when the motorbus became supreme, and had them removed to a piece of land at one of the watering places. After fixing them up as shown in the illustration, he rents them as holiday residences.



Old Omnibus Converted into Two-Story Villa for Holiday Rental

MOTORCYCLE ENGINE CUT OUT BY BRAKE

A motorcycle rider of Chicago whose machine is fitted with a band brake has devised a magneto cut-out which stops the engine when the brake is put on full pressure. A wire is run from the magneto to the brake and tapped onto the moving arm which pulls the brake band tight around the drum when the brake is applied. The end of this wire, from which the insulation is stripped, is bent so that when the brake is fully applied, it touches the outside shell of the brake, thus short-circuiting the current. When the brake is released, the brake arm, in moving back, breaks the connection and holds the wire end clear, thus allowing the engine to run again.



The idea is considered excellent for emergencies, for the simple back pressure of the pedals puts on the brake and stops the engine without lifting the valves, the compression of the motor thereby giving added braking power.

TRAINING THE PUBLIC TO "KILOWATTS"

So far advanced is the campaign to abolish the use of the old familiar word "horsepower" and substitute as a measurement of power the less widely understood word "kilowatt" that the Bureau of Standards will now record power in kilowatts and not horsepower, while the American Institute of Electrical Engineers recommends this use generally.

There was, before 1911, no precise definition of the horsepower that was generally accepted and authoritative, and different equivalents of this unit in watts are given by various books. The most frequently used equivalent, both in the United States and England, has been 746 watts; and in 1911 the American Institute of Electrical Engineers adopted this as the exact value of the horsepower.

It is obviously desirable that a unit of power should not vary from place to place, and the horsepower thus defined as a fixed number of watts does indeed represent the same rate of work at all places. Inasmuch as the "pound" weight, as an element of the unit of force, varies in value as the acceleration of gravity varies, the number of foot pounds per second in a horsepower accordingly varies with the latitude and altitude. It is equal to 550 foot pounds per second at 50 deg. latitude and sea level, approximately the location of London, where the original experiments were made by James Watt to determine the magnitude of the horsepower.

The "continental horsepower," which is used on the continent of Europe, differs from the English and American horsepower by more than one per cent, its usual equivalent in watts being 736. This difference is, historically, due to the confusion existing in weights and measures about a hundred years ago.

Since a unit of power should represent the same rate of work at all places, the "continental horsepower" is best defined as 736 watts. This is equivalent to 75 kilogram meters (542.5 foot pounds) per second at latitude 52 deg. 30 min., or Berlin.

These values, 746 and 736 watts, were adopted as early as 1873 by a committee of the British Association for the Advancement of Science. The value, 0.746 kilowatt, will be used in future publications of the United States Bureau of Standards as the exact equivalent of the English and American horsepower. It is recognized, however, that modern engineering practice is tending away from the horsepower and toward the kilowatt.

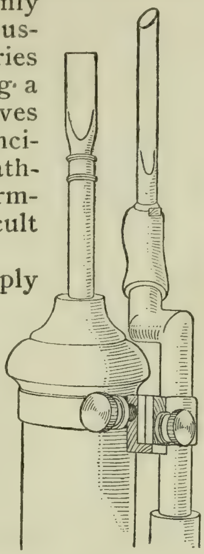
STEREOSCOPIC MICROSCOPE WITH SINGLE OBJECTIVE

A new microscope which gives a stereoscopic view of the object, although only provided with one objective, was recently exhibited before the French Academy of Sciences, Paris. Its range of magnification is from 10 to 400 diameters, giving an excellent relief-view. Previously constructed binocular microscopes having two objectives were not satisfactory for magnifications over 80 diameters.

With this new microscope the objective can be placed very close to the object, which increases the magnifying power, and the objective of any ordinary microscope can be used with it. The pencil of light, after passing through the objective, is divided by means of two reflecting prisms into two equal and symmetrical parts which pass to the oculars, the distance between which can be adjusted to suit the pupillary distance of the observer.

BELLOWS AID IN PLAYING CLARINET

European musicians who play wind instruments are interested in the invention of a German of their profession which not only makes it possible to sustain a long note or series of notes without taking a fresh breath, but relieves much of the fatigue incident to the forced breathing necessary in performing a long or difficult part.



The apparatus is simply and cheaply made and is essentially a sort of auxiliary lung for the musician who handles a horn, a clarinet, an oboe, or any other wind instrument requiring sustained and forced breathing. The musicians who have observed the use of the apparatus say that it aids rather than injures the tonal effects of a legato movement.

The "aerophore," as the apparatus is called, consists primarily of a compressed-air tank. This tank is attached at the end of the instrument farthest from the player and from it a rubber tube runs down to the floor and connects with a bellows operated by means of the musician's foot. The upper end of the tank has a brass or silver tube running alongside of the instrument and terminating in a mouthpiece parallel to the ordinary mouthpiece of the instrument.

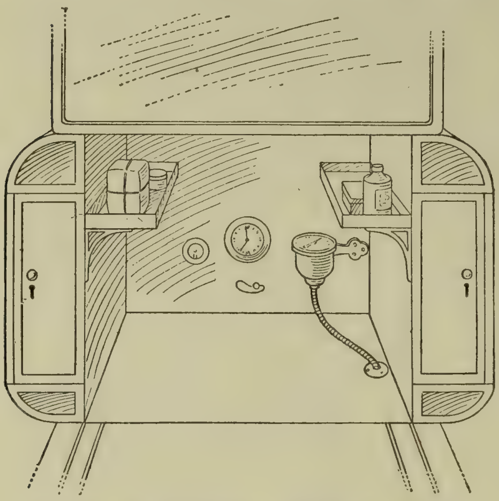
In using the apparatus, the player puts both mouthpieces into his mouth and when necessary works the bellows. This fills his cheeks with air which he forces into his instrument.

Some little practice is required to learn to use the two mouthpieces at once, but the trick of doing it is said to be easily mastered.

¶Tar oil is being used as a fuel for several Diesel engines of 600 to 800 hp.

AUTOMOBILE DASHBOARD AS STORAGE SPACE

That the deep, inset dashboards of the present type of automobile body may be used for the storage of small articles has been demonstrated by an English motorist. His dashboard is arranged as shown in the drawing, there being a tall cupboard at each side and two small shelves. The left-hand cupboard is divided up into felt-lined partitions to carry a bottle of whiskey and a siphon of soda, with divisions at the top for glasses. The right-hand cupboard is used for the storage of dusters, oil cans, and the like, and the shelves provide a place for gloves, goggles, tobacco and matches, maps, etc.



Showing the Possibilities of Dashboard Storage

SAFETY INDICATORS FOR AIR PILOTS

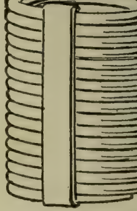
Officers of the United States army and navy who are interested in aeronautics are just at present engaged in a discussion with certain French manufacturers over the relative merits of "speed indicators," which are in reality danger (or safety) signals for air pilots.

The apparatus in question is called an anemometer-vane indicator and is designed to show the airman the speed at which he is going, the velocity of the wind, the angle at which he is attacking it and whether he is rising or falling. The essential principle of the apparatus is that a resisting surface measures the velocity of the wind.

United States army officers claim that this apparatus cannot at all times be accurate as it must be dependent on a spring and adjusted on the ground before flight. The spring is at that time set at zero. It is the view of the Americans that the essential thing is not so much accuracy at zero, but at and near the standard speed of the air craft. This is because the range of speed in an aeroplane is very restricted.

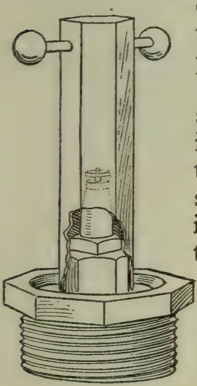
One of the most noted French authorities on the subject of aeronautics asserts that none of the indicators at present on the market goes far enough in the solution of the problem of safety in the air. So far, the most satisfactory of these little devices does no more than tell the pilot, in shorter time than he would otherwise know it, just how his craft is behaving. He has then to work his controls accordingly. So this authority recommends the production of an indicator that will not only tell of the air conditions about the aeroplane, but will at once automatically operate the controls—in short he suggests an automatic stabilizer. These views coincide with those held by eminent American authorities.

QUICK REPAIR METHODS FOR RACING PITS



The necessity for rapid repair work in automobile racing has resulted in many labor and time-saving devices being designed by the repair specialists who inhabit the racing pits during contests. Among the many time-savers the clip for valve springs and the spark-plug arrangement here shown are of particular interest.

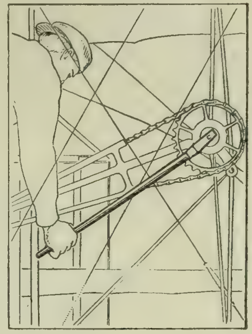
To replace a defective valve spring on a hot engine in minimum time requires much ingenuity, and the way devised by one of the "pit" repair men is ingenious. He made a number of clips from sheet steel, having the required length, and with the ends turned over at right angles for about a quarter of an inch, and then compressed the spare springs and held them compressed by slipping two clips over each. Similar clips are used in removing old springs, a lifter being employed to lift them. When the new valve spring is inserted, the clips are quickly removed, and the spring snaps into position.



When a change of spark plugs is required it is often found that the plugs have become so tight that the cylinder caps screw out at the same time. A number of spare plugs are therefore prepared ready screwed into cylinder caps, and with socket wrenches attached, to meet such an emergency, which, dealt with in the ordinary way, would consume much greater precious time.

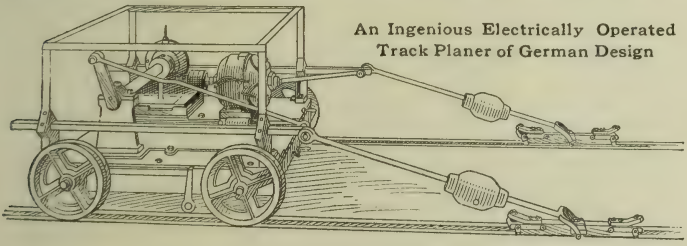
ENGINE CRANKER USED ON HYDRO-AEROPLANE

It is obvious that the method of starting an aeroplane's engine resorted to on an aviation field, which consists in grasping the wooden propeller or propellers and whirling them around, is impracticable for hydro-aeroplanes. Therefore the Burgess hydro-aeroplanes are provided with a special starting device, which consists of a long handle inserted in a socket fastened on a special ball ratchet on one of the sprockets of the chain drive. Pulling this handle up turns the engine over twice, or even three times, and always starts it without difficulty. The throttle is, of course, shut down, and the operator has an opportunity to resume his seat while the hydro-aeroplane is moving slowly through the water.



GERMAN TRACK PLANERS

A track planer of ingenious type, constructed in Germany, is shown in the accompanying illustration. The planers, which are mounted on a light four-wheeled truck, are electrically driven. The shifting of the weights on the long planer shafts, extending out from one end of the truck, regulates the pressure of the planers on the track surface.



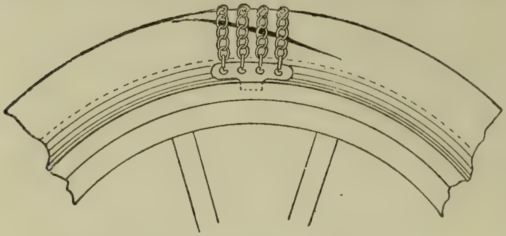
An Ingenious Electrically Operated Track Planer of German Design

A SURPRISE IN MATHEMATICS

Supposing an automobile and an aeroplane were racing around the world, the automobile running along, say, a meridian, a distance of approximately 25,000 miles, and the aeroplane along the same meridian but 528 ft. or one-tenth mile above it, how much longer would the run of the latter be? No small handicap, one would think, but surprisingly insignificant, as a simple calculation will show, for the difference in the two paths will be found to be only about 3,300 ft. or a little more than half a mile in favor of the automobile, which is scarcely worth mentioning.

ANCHOR PLATES REPLACE TIRE TAPE

Anchor plates connected by four strong chains have recently been patented as the latest innovation in repairing automobile punctures, cuts and blowouts. Their purpose is pretty well explained by saying that they are designed to replace the troublesome tape ordinarily used after a blowout to prevent the inner tube from coming out through the hole in the tire. The four chains are permanently fastened to one of the anchor plates and the end links slide into dumb-bell slots on the other anchor. This holds the broken portions of the casing closely together.


Chain and Anchor Plate Tire Repairer

LILLIPUTIAN FARMS ON FRENCH ISLANDS

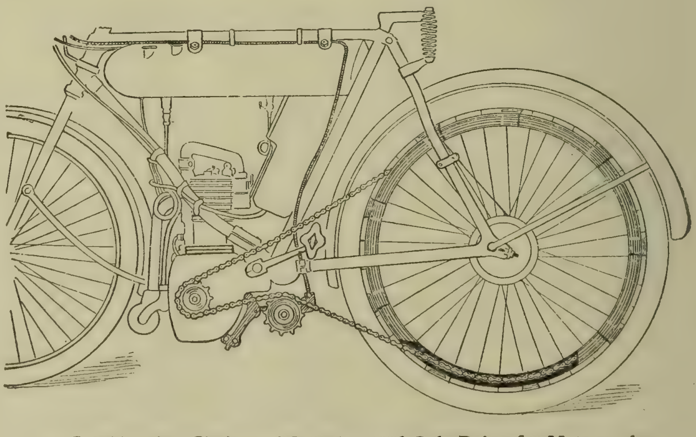
On the numerous small islands in the English Channel and in the Atlantic along the coast of Brittany may be found some of the smallest "farms" in the world. Many of these islands are for the most part laid out into evaporation basins, divided by dikes, for the production of salt. These dikes provide narrow strips of remarkably fertile soil, and the vegetable patches upon them are the most valued possessions of the inhabitants. By continuous divisions among succeeding generations of heirs the holding of a single family has, in some instances, dwindled down to a mere 10 square feet.

When the individual owner does not cultivate his "farm" for his own benefit, whole communities cultivate the strips jointly, sharing the products pro rata. The crops consist of onions, potatoes, cabbage and other vegetables, together with oats, corn, clover, timothy, etc.

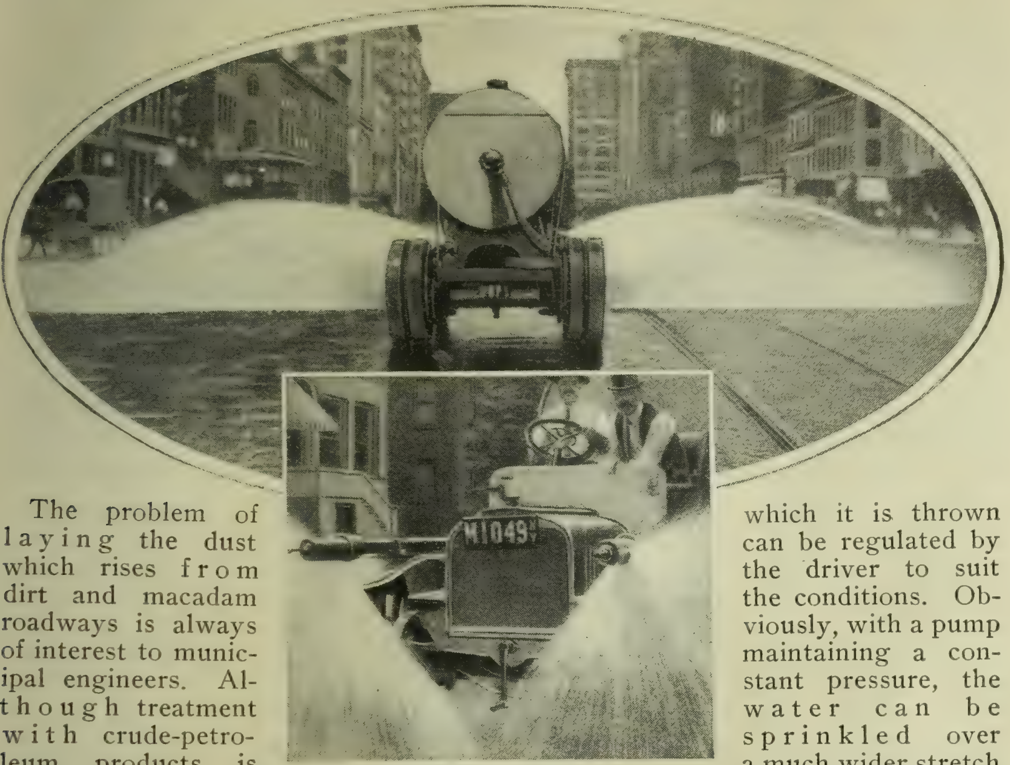
A NEW CHAIN-DRIVE FOR MOTORCYCLES

The generally adopted form of power transmission from motor to drivewheel on a motorcycle is the belt; chain and gear drive having been abandoned as impracticable.

A happy combination of the principles of chain and belt drive, however, has been recently devised by a French engineer. By substituting sprocket wheels for the grooved driving and tension pulleys, most of the loss of power caused by sliding of the belt is claimed to be eliminated, while on the other hand, the large pulley on the drive wheel is the same as on a regulation belt-drive machine, except that the groove of this pulley is lined with leather. Thus, in this part of the transmission friction drive is retained, just as in the belt-drive machine, while the engine end of the drive is chain and sprocket.


A Combination Chain-and-Sprocket and Belt Drive for Motorcycles

SPRINKLER THAT SPRINKLES ITS OWN PATH



Rear and Front Views of Newest Form of Water Wagon, Which is a Motor-Driven Vehicle That Sprinkles a Wide Expanse of Pavement

The problem of laying the dust which rises from dirt and macadam roadways is always of interest to municipal engineers. Although treatment with crude-petroleum products is now in common use, and has proved very successful, the high cost of this method is often prohibitive, while daily sprinkling with plain water is both effective and inexpensive. The motor sprinkling apparatus here shown is the first of its kind, and was designed for the street-cleaning department of Indianapolis. The feature of this sprinkler is that the nozzles are slightly in front of the body of the truck, thus allowing the apparatus to sprinkle its own path. The riveted tank, of 1,400-gal. capacity, is mounted on a 6½-ton truck, securely guyed to prevent the tank from slipping. The water is forced through the nozzles by a double-acting force pump, which is driven by the automobile motor.

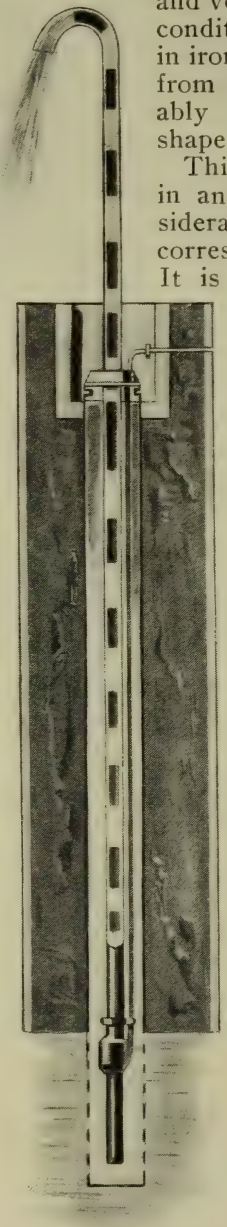
The nozzles are adjustable within wide limits, so that the quantity of water thrown out and the distance to which it is thrown can be regulated by the driver to suit the conditions. Obviously, with a pump maintaining a constant pressure, the water can be sprinkled over a much wider stretch of roadway than would be possible were the water permitted to flow out by gravity, and the areas sprinkled can be maintained constant until the last drop is out of the tank, whereas, with gravity feed, the area naturally diminishes with the loss of head in the tank. It is claimed that a roadway from 70 to 80 ft. wide can be sprinkled at one operation, and at a rate of well over 10 miles an hour, which naturally is quite beyond the scope of the horse-drawn sprinkler.

¶A new projectile for use against dirigibles and balloons, provided with a device which at the contact of the projectile with the envelope causes an electric spark to be emitted, thus igniting the gases, has been invented in Germany.

COMPRESSED-AIR PUMP FOR GREAT DEPTHS

A compressed-air pump, manufactured in Germany, and particularly adapted for raising water from deep sources, is shown in the accompanying drawing. The pump consists of a water pipe, open at the bottom, and a smaller air pipe connected with it by a specially constructed joint. The two pipes are parallel and very close together, in order that the bore hole for the pump casing may have a small diameter.

When this pump is used to elevate water from only a small or medium depth it is necessary that the air and water pipes be sunk vertically into the water for from one-half to two-thirds their length. The compressed air introduced into the water pipe rises in this pipe along with the water, so that the column rising is alternately water and air.



AIR-BUBBLED RUBBER FOR AUTOMOBILE TIRES

In the search for a substitute for pneumatic automobile tires, a French concern is seeking to produce a tire filling that will provide a degree of resilience approaching that of compressed air, but which, according to the Motor World, will be free from the constant tendency to escape that is manifested by closely confined atmosphere.

The plan comprises the use of a very considerable volume of nitrogen, put up so that it is divided into an enormous number of tiny globules, each surrounded by a cell of thin but tough rubber. Nitrogen is used because it will not seep through rubber as will oxygen. In making this tire filler, rubber is so treated while in a semiliquid state that it assumes a frothy consistency, there being a great deal of bubble and very little rubber. While in this condition the rubber is vulcanized in iron molds, and, upon being taken from the mold, expands considerably without, however, losing its shape.

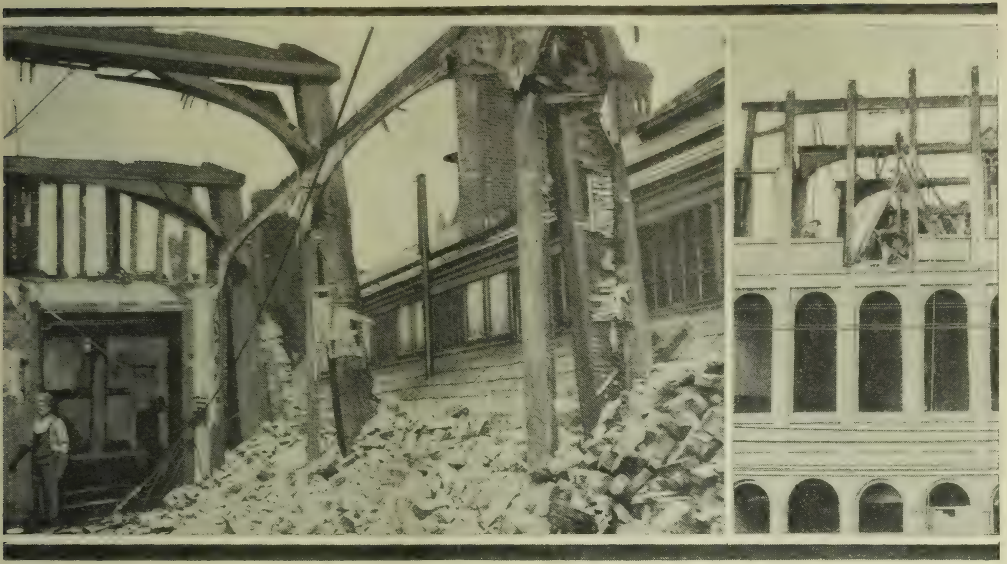
This rubber "froth," when placed in an outer tire, undergoes a considerable reduction in size, with a corresponding increase in pressure. It is claimed that the amount of rubber in this filling is about the same as that in the inner tube of an ordinary tire of the same size.

As the small number of diminutive cells pierced would bear an almost infinitesimal ratio to the whole number, a puncture in this filling would have no effect whatever.

The French army is conducting tests of the air-bubble filler to ascertain its suitability for the tires of army trucks.

ACCIDENT PREVENTION IN MACHINE SHOPS

The management of a machine-tool works in Providence, R. I., has, during the last several years, kept a careful record of all accidents and made a study of them in the endeavor to ascertain just where danger is greatest and what accidents can be prevented by means of improved safety devices. One recently installed device, particularly interesting, is an electrically operated control by which the power at the engine room can be stopped by pushing a button anywhere in the works.



On Wrecking This Building, Erected in 1823, It was Discovered to Have a Skeleton Similar to That Adopted in the Erection of Modern Buildings, but, of Course, of Great Timbers Instead of Steel

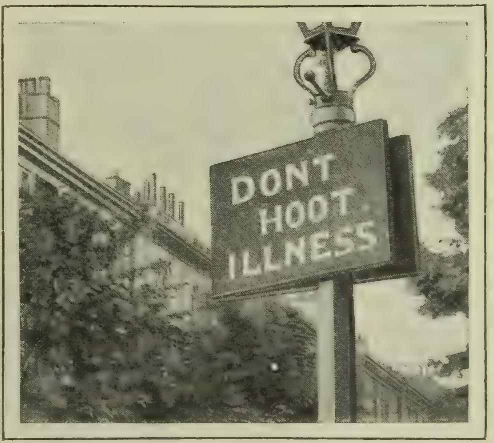
MODERN CONSTRUCTION IN OLD BUILDING

The razing of an old four-story bank building in Providence, R. I., erected in 1823, shows that the particular method of building construction now practiced, credited to a Chicago architect of the early eighties, was used, in one instance at least, nearly a century ago.

Steel construction was unknown in 1823, but John Holden Greene, who erected the building in Providence, used wooden timbers instead of steel, in exactly the way steel is now used. He erected the building's skeleton of great logs of spruce, adding the brick front with its granite facing, and tying the latter to the frame with great bolts at each floor.

APPEALS TO MOTORISTS FOR QUIET

"Zone of Quiet" has become a familiar sign in American cities in the vicinity of hospitals, but a variation of this legend is coming into use in the streets of London. The accompanying illustration discloses it. An American probably would at first interpret it as an appeal to the "hooligan" element, as "hoot," in United States parlance, means a jeer or shout of contempt. The sign, however, is directed at the motor-car driver who is thus requested not to sound his honking horn, squawker or siren near the house where there is serious illness. Before the day of rubber-tired vehicles it was the custom to strew the street with straw or tan bark, but now the automobile horn has become a greater annoyance to sick people than the clatter of iron-shod feet on the pavement.



A London Street Sign Which Appeals to Motor-Car Drivers to Keep Their Horns Silent

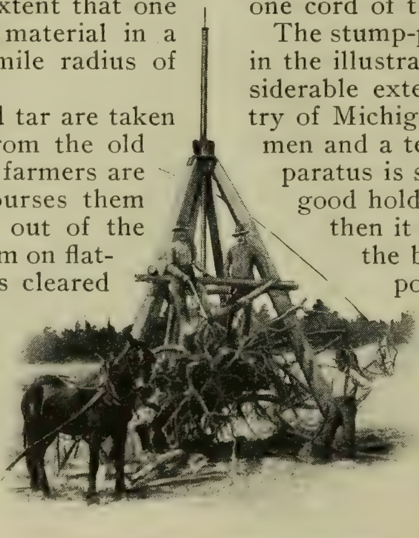
Wolf-hunting by night in Northern Russia is in strong contrast to practically all other hunting sports in that the animals chase the hunters instead of being chased by them. The hunting party rides in a sleigh drawn by three fast horses, and young pigs, carried in a basket, are used to attract the quarry. A pig is held aloft by the tail and its squeals lure the wolves toward it, the hunters shooting them down as they follow the swiftly moving sleigh.

THE STUMP INDUSTRY IN MICHIGAN

Norway-pine stumps have become a by-product of cut-over timber lands in Michigan to such an extent that one factory is buying the material in a territory within a 50-mile radius of the plant.

Resin, turpentine and tar are taken in paying quantities from the old stump and roots. The farmers are paid a rate that reimburses them for taking the stumps out of the ground and loading them on flatcars, and the land thus cleared is, in a great many instances, being planted with fruit trees.

When the stumps reach the factory they are cut into short blocks or chunks and placed in cagelike steel cars, which are run into a retort heated to the required temperature. About 26 gal. of turpentine, 57 gal. of tar, and 40 bu. of charcoal are produced from one cord of the raw material.



Pulling Pine Stumps in Michigan

The stump-pulling apparatus shown in the illustration, and used to a considerable extent in the stump industry of Michigan, is operated by three men and a team of horses. The apparatus is set up over the stump, a good hold is secured upon it, and then it is pulled by winding up the big perpendicular screw, power being obtained by driving one of the horses around the apparatus.

¶In a new two-piece spark plug for gasoline engines the lower part of the plug remains fixed in the cylinder when the upper part is taken out to be cleaned.

TERRAPIN HUNTING IN THE SOUTH

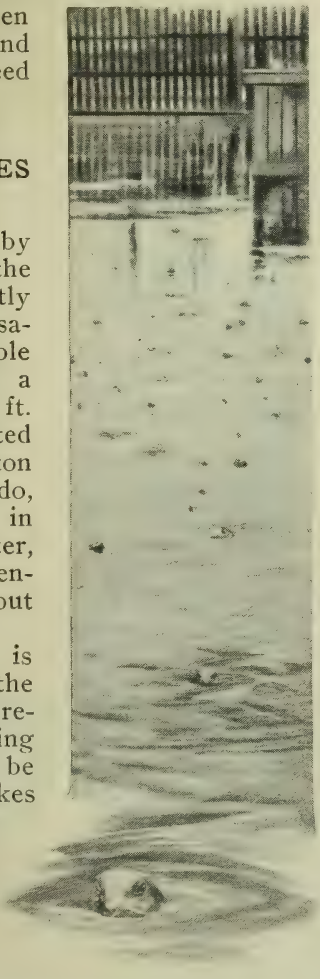
Terrapin farming is one of the industries peculiar to the lower coast of Louisiana and Mississippi. At Grand Isle, on the southern shore of Louisiana are pens containing as many as 9,000 terrapins, and the big turtles are hunted with dogs in the surrounding swamp prairie.

The terrapin is fed regularly with meat and the mere chopping of the meat ax on the block near the pen will bring them racing to that end of the pen like chickens to a feed of corn.

A TORPEDO THAT CARRIES A GUN

The gun-torpedo, devised by Commander Cleland Davis, of the United States Navy, and recently tested in the waters of the Chesapeake, carries an 8-in. gun capable of expelling a projectile with a muzzle velocity of about 1,000 ft. per second. With the gun-projected projectile replacing the guncotton warhead of the Whitehead torpedo, little of the force is dissipated in disturbing the surrounding water, practically all the force being centered in driving the projectile out of the gun.

When the gun-torpedo is launched, the little propeller at the upper side of the torpedo's nose revolves, and this releases a tripping rod, thus enabling the gun to be discharged when the torpedo strikes the enemy's hull. When this tripping rod hits the hull or other obstruction it is driven backward and engages a trigger which first compresses a spring and then releases it, so that the pin can strike the primer head and set off the explosive which drives the projectile out of the gun. The projectile, thus driven through the hull of the enemy, is exploded a predetermined time very shortly after the impact.



A Terrapin Pen on the Southern Coast of Louisiana

MOTHER PLEADS FOR DEAD AIRMAN'S IDEALS

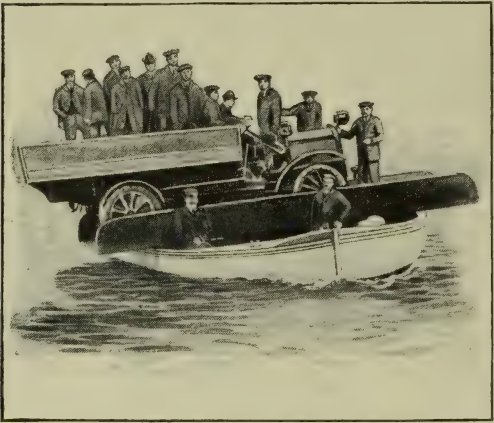
On the eve of her son's funeral, Lady Loraine, the mother of Captain E. B. Loraine, of the Royal Flying Corps of England, who was killed in the performance of his duty, wrote the following letter to a London newspaper pleading for a greater development of the military aerial service:

"On the eve of my son's funeral I ask you of your courtesy to publish this letter, trusting you will deem it timely and likely to have the result which, in loyalty to my son's ideals, I am ambitious to see fulfilled.

"The unanimity with which deep regret has been expressed at the loss of Captain Loraine's services to his country, and the recognition by those in highest authority that his services were of a character of which the Empire stands most in need in the matter of land defense, emboldens me to plead with my countrymen, and countrywomen, that they should raise within the next few weeks not only a National, but an Empire Fund, to be presented to the Crown; in order that the Royal Flying Corps (an essentially vital arm of the Naval and Military Services) be put at once upon such a sound financial basis that no alternation of government, no loss of individual life in pioneer work, may cause the slightest check to the advance movement."

POWER FERRYBOAT USED BY MOTORISTS

The motorists touring England will no longer be subjected to the inconveniences of the old-style hand-propelled ferryboat, if more watermen will adopt a small power-driven boat such as is now in use at the Loch Leven ferry in Scotland. A few years ago an old-school oarsman would have sneered at the idea of a motor ferry, but so rapidly is it finding its way into inland water service, that it is safe to say that in a few years the hand-propelled ferry will be obsolete.


Stability Test for Power-Driven Ferryboat

The very interesting boat recently put into service at the above-mentioned ferry, is equipped with a turntable platform for carrying automobiles. It is 30 ft. long and has a beam of 14 ft., the excessive beam being necessary for the stability of the craft when loaded. When the boat comes alongside the jetty, the turntable is turned at right angles to its keel and the motor car is driven upon the boat by its own power. Then the turntable is straightened up, and, after the trip is made, the car is again turned and may be driven off the boat and up the bank. This ingenious device does away with all the vexing delays of loading and unloading.

HUGE STONE SLAB QUARRIED BY THE ANCIENTS

At Baalbec, Syria, is a great stone slab, 69 ft. long, 14 ft. broad, and 17 ft. in depth, and weighing 1,500 tons, quarried by the Ancients with the intent of using it to adorn the "Temple

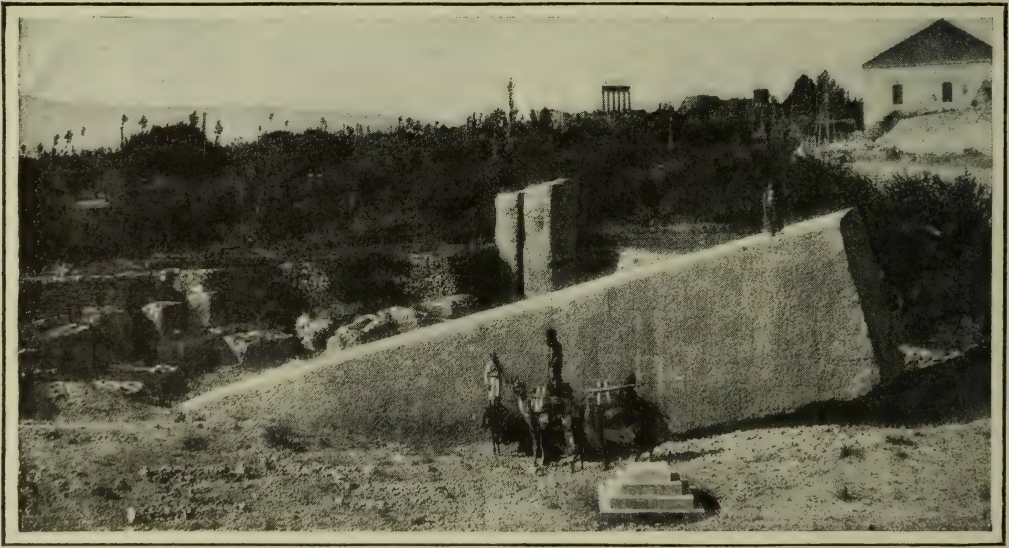
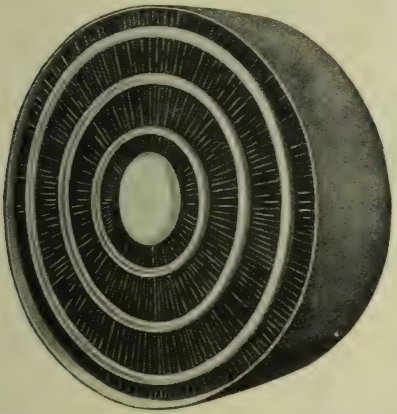


Photo by American Colony, Jerusalem

A 1,500-Ton Stone Slab Quarried in Syria by the Ancients of the Sun," located near by, and now, of course, in ruins. The huge monolith is said to be one of the largest ever quarried, but in the temple wall which still stands are many others of almost as great a size.

RADIATOR WITH INDIRECT RADIATING SURFACES

A remarkably effective radiator has been devised by a professor of a technical high school in Prussia. The fundamental principle of the apparatus is the use of a great number of indirect radiation surfaces made of a material that has a high conductivity of heat. For this purpose very thin zinc-covered copper bands are disposed radially in the circular body of the radiator between the concentrically arranged hot-water or steam-heating coils, which are flat. By properly calculating the surfaces, cross sections and other dimensions, an extraordinary heating efficiency is obtained with a minimum of material.



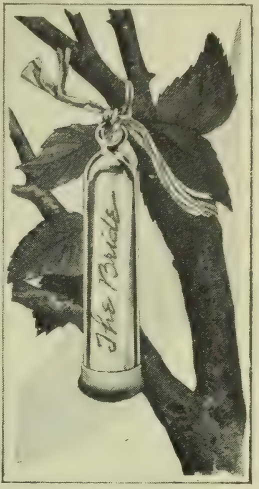
The New German Radiator Which is Said to Give an Extraordinary Amount of Heat

This efficiency is said to be so great that a radiator 28 in. in diameter and 14 in. high can raise the temperature of nearly 400,000 cu. ft. of air over 100 deg. F. per hour.

¶Lieut.-Col. C. B. Winder, of the Ohio National Guard, is the first militia officer granted an air pilot's license by the War Department.

GLASS-INCLOSED LABEL FOR PLANTS

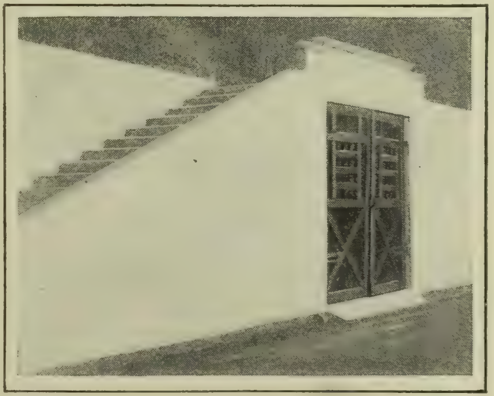
An ingenious plant label recently placed on the market consists of a small flat glass tube open at one end. The other end is closed and finished with a glass ring, by means of which the label can be affixed to the plant. The name of the plant is written on a piece of oiled paper provided for the purpose, and this is slipped into the tube and held in position by a small rubber cap, which fits over the open end. This label is dirt and waterproof.



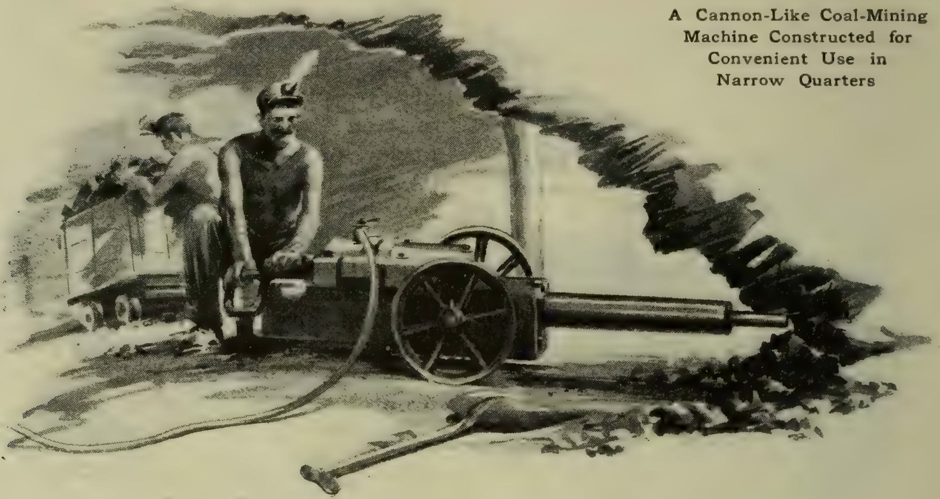
A Glass-Enclosed Label Marking a Bride Rose

GARAGE CONSTRUCTED IN RETAINING WALL

A Los Angeles development company found it necessary to cut several miles of winding roadway into the sloping hillsides of the Montecito Hills, which are being laid out for home builders. This made long



One of the Garages Built into a Concrete Retaining Wall stretches of concrete retaining walls necessary on the uphill side of the roads. Ordinarily, such walls are used only as retainers, but in this instance they are also utilized as garage space. The walls are about 9 ft. in height, and small concrete garages are constructed into them at certain intervals. The top of the retaining walls is the sidewalk of the uphill side of the roads, and at each garage there is a flight of steps leading up to it.


A Cannon-Like Coal-Mining Machine Constructed for Convenient Use in Narrow Quarters

COMPRESSED-AIR GUN FOR COAL MINING

This machine, which resembles a cannon, is a compressed-air gun for the mining of coal. It weighs 900 lb., and exerts a pressure of 2,000 lb. against the piston which is shown projecting from its mouth. The piston, directed against the coal, strikes 100 blows per minute.

It is a portable machine, resting on two wheels, and pushed about by means of the large handle provided at the rear end.

ℭThe effort to save the time of transatlantic travelers has taken the form of a project to build a railroad across Ireland, a company with a capital of $6,500,000 having been formed for the purpose.

THE MOST POWER FOR THE LEAST FUEL

A new French modification of the famous Diesel engine has just set a new mark for low fuel consumption per horsepower of energy output. As is generally known, the Diesel motor has long held the efficiency record, with a fuel consumption of .43 lb. of petroleum per horsepower hour, equal to a conversion of over 40 per cent of the theoretical heat units in the fuel into mechanical energy, but the new engine has brought the figure down to .392 lb. per horsepower hour—and this with a 500-hp. marine power plant burning the cheapest grade of crude residue oil.

Something of what this may mean to the future of the marine power problem will be appreciated by a perusal of the test figures given out on this motor. According to these, in a test run at the normal speed of 400 revolutions per minute, the fuel consumed in an hour was 183 lb. 9 oz., which at 3 cents a gallon would cost 73 cents. An ordinary 500-hp. gasoline marine engine in the same time consumes 314 lb. of fuel, which at 12 cents a gallon equals about $5.16 an hour, just about seven times as much. Moreover, on a given tank capacity, the greater weight of fuel consumed by the gasoline motor will give a vessel equipped with it a much less radius without refilling tanks. The comparative safety of crude oil as compared with gasoline is also an important consideration. In another test, of a 40-hp. motor, in four hours the consumption of heavy Russian residue oil was 1¾ gal. against the 4 gal. which would be excellent economy for a gasoline motor of the same power working under full load. These motors are built in sizes all the way from a 2-cyl., 10-hp. to an 8-cyl., 6,000-hp., and they have, so far, been built exclusively for the French government, which has adopted it for the navy. The extreme economy of this motor is due to a curious scheme of double injection during each working stroke. The engines are four-cycle, and as in all Diesel motors, the fuel is injected into air compressed to about 500 lb. per square inch, which renders it so hot that ignition occurs spontaneously upon injection. But in the new design, there is the dual injection, the first sprayed in by an air blast at a pressure of 800 lb. per square inch, and burned at constant pressure, and the second a rapidly following additional charge, burning at constant volume.

BIRDS AND POLAR BEARS AS TRAINED FISHERS

Birds are trained, in China, to catch fish according to the Fishing Gazette. At a given signal they dive into the water and bring up large fish grasped in their bills. It is said that polar bears were at one time taught by the Icelanders to jump into the sea and catch seals, and there are other instances in which animals have been trained to capture water creatures.

SUSPENDERS FOR WOMEN

New Skirt Supporter Resembles "Galluses" and Relieves Pressure around the Waist

The latest dress idea borrowed from men by woman is the suspender. Several large London department stores have been exhibiting suspenders in their windows as the latest approved method of holding skirts in position. The suspenders for women are made of a web material, and can be purchased in almost any color.

ℭThe death rate in Australia is 10.5 per 1,000. Only one country in the world can show a better rate, New Zealand, where it is 9.75.

PHOTOGRAPHING THE "CURVATURE OF THE EARTH"

By C. H. CLAUDY

You would say it could not be done, and, in fact, it cannot, for the photograph herewith, while taken from a balloon at a height of a mile and apparently showing the curvature of the earth, represents one of the numerous cases where a camera tells a most astounding lie.

The curvature is an effect of the kind of camera used and the angle at which it was pointed. The instrument was what is known as a panorama kodak, the objective tube of which can be swung through an arc. The film is held in a curved position, the radius of the curve being equal to the focal length of the lens. In making an exposure, the lens tube is held to one side of the camera, and, when released, describes an arc of a circle through the air. The image formed at the focus of the lens is thus imprinted on the photographic film in successive overlapping stages.

In any picture of this kind, distortions are present, less pronounced in the case of landscapes than in pictures of buildings, but this defect may be corrected by bending the print in a semicircle and looking at it in that position. This particular picture, however, was made with the camera pointed downward at an angle, and therefore the resulting distortion cannot be cured by any form in which the print may be twisted.

It need hardly be said that no curvature could be seen as shown in this photograph, no matter at what height the balloon may have been, for the visual effect

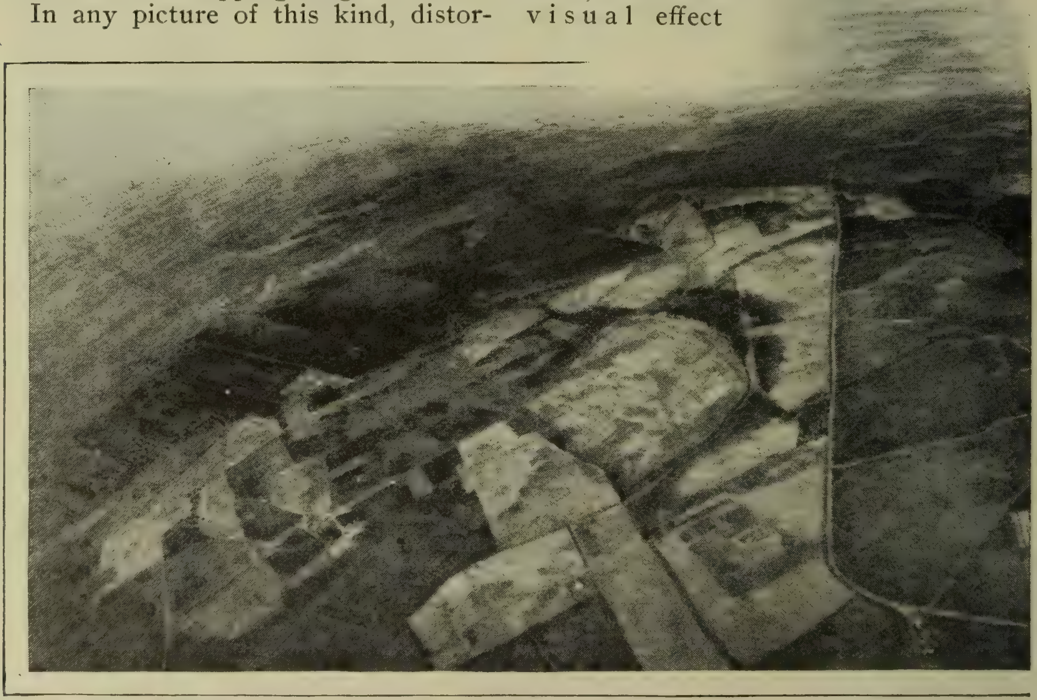


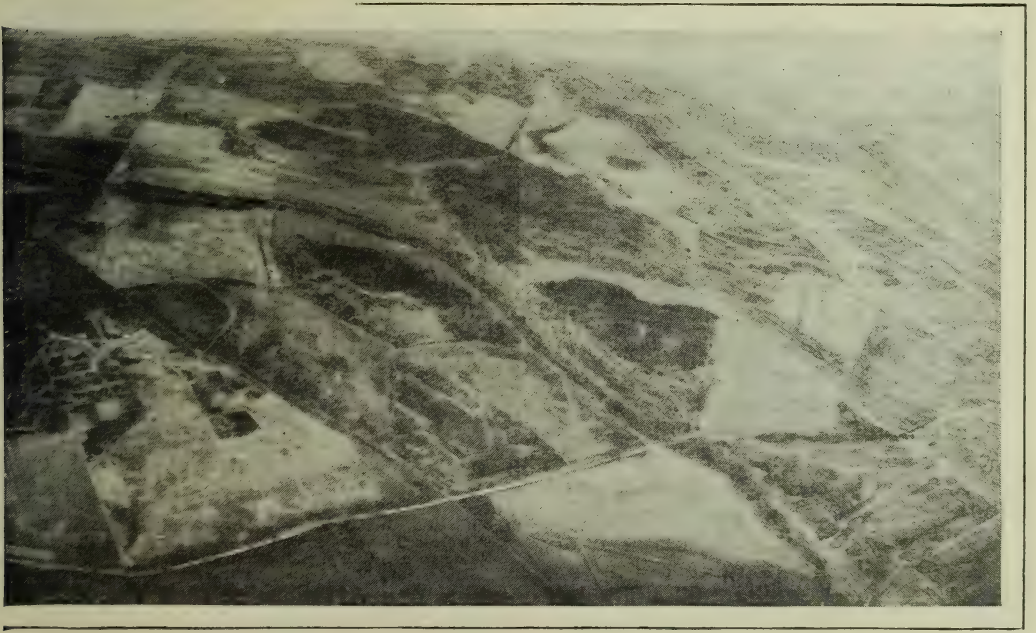
Photo by Claudy, Washington

Panoramic Photograph of Earth's Surface from a Balloon Gives the Deceptive Appearance

from a balloon is that the earth appears concave, like a great bowl, and the higher one is the greater this effect, the reason being that the horizon, always on a level with the eye, becomes more distant the higher one rises, while the earth is obviously far below.

FLATIRON AN AID IN ENGINEERING

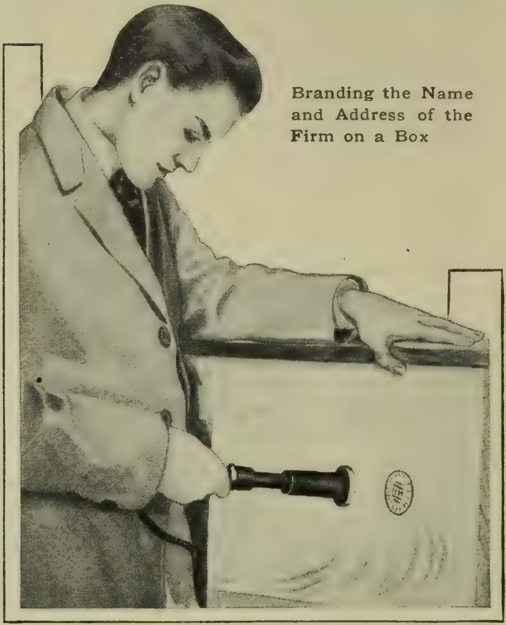
Waterproofing a shaft lining with an electric flatiron appears to be a novel adaptation of a domestic utensil for engineering purposes, but such a thing was done in connection with the construction of the enormous Catskill aqueduct which will convey water to the people of the city of New York. In the contract for the construction of one of the shafts, the stipulation was made that the shaft lining should be of concrete, followed by a lining of porous building tile, on which was to be placed a layer of waterproof felt with a final covering of concrete. The contractor found great difficulty in keeping the waterproof felt in place until the concrete could be applied. It did not adhere well to the tiling and it was found impracticable to attach it by the usual methods. One bright engineer on the works, however, found that the felt could be held to the tile if it were heated,—but the difficulty was in heating it fast enough. An electric flatiron was procured and found to do the work in fine shape. The felt would be moistened with a damp sponge, placed against the tile, and the iron passed over the other face. It was found that an expert workman could do the work rapidly. Two 8-lb. irons were used in the lining of 486 ft. of shafting. So great was the success, that the contractors have adopted this method of lining shafts.



of Curvature of the Earth, While to the Eye in a Balloon the Appearance is That of a Bowl

ELECTRIC BRANDING IRON FOR COMMERCIAL USES

The electric branding iron is steadily growing in popularity for commercial purposes. One of the large automobile-tire companies uses them for branding tires, and they are also extensively used for branding packing boxes, and the like. The ordinary iron soon cools and has to be reheated, while the electric iron is always ready after the few minutes of preliminary heating.


Branding the Name and Address of the Firm on a Box

PERFUME PUT UP IN PENCIL FORM

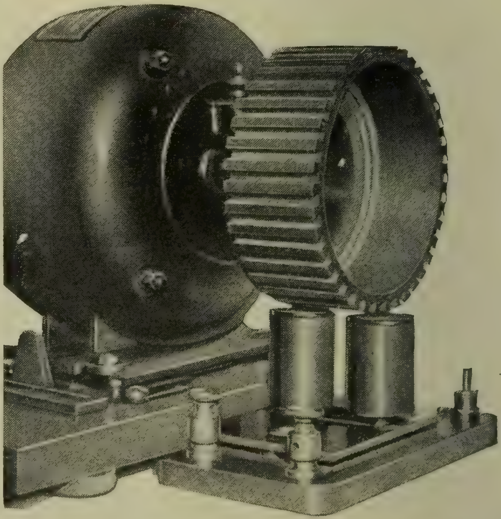
The perfume pencil is a novelty likely to meet with popular favor. It is made in the form of a cone or cartridge, similar to headache pencils. The softer type of perfume pencil is made of cocoa butter as the basic material, but for moderately hard pencils artificial musk is used for the foundation.

The pencils, which are being made in almost all the popular odors, are coated in metal molds. The finished pencils are inclosed in metal retainers for marketing.

INGENIOUS GENERATOR FOR WIRELESS

A small and inexpensive high-frequency generator that should appeal to amateur wireless operators and to the numerous wireless schools was devised recently for a wireless school in Philadelphia, which had experienced considerable trouble in getting a suitable spark or current to operate the head telephones used in the class room.

The generator, which gives a so-called singing arc with a frequency of 1,200 pulsations per second, has now been running for eight months without trouble. In devising the outfit, a cast-iron rotor, having 40 teeth, was fastened to the shaft of a 1/40-hp. induction motor, and the permanent field magnet placed as close to the rotor as possible. With this apparatus the current is generated as follows: When there is only an air space between the north and south poles of the permanent magnet there is great resistance to the lines of magnetic force, hence comparatively few of these lines traverse this space. But when one of the teeth of the rotor passes this air space, the resistance, by the introduction of the iron tooth, is


Small and Inexpensive High-Frequency Motor for Wireless Outfits, Devised by Attaching a 40-Toothed Rotor to a 1/40-Hp. Induction Motor

reduced considerably, a great flow of magnetism takes place from the north to the south pole of the permanent magnet, and the resultant disturbance of the magnetic lines sets up a current in the magnet coils each time. The induction motor runs at a speed of 1,800 revolutions per minute, or 30 per second, and, as the rotor attached to and revolving with it has 40 teeth, the magnetic fluctuations are at the rate of 1,200 per second, thus generating a current of that frequency.

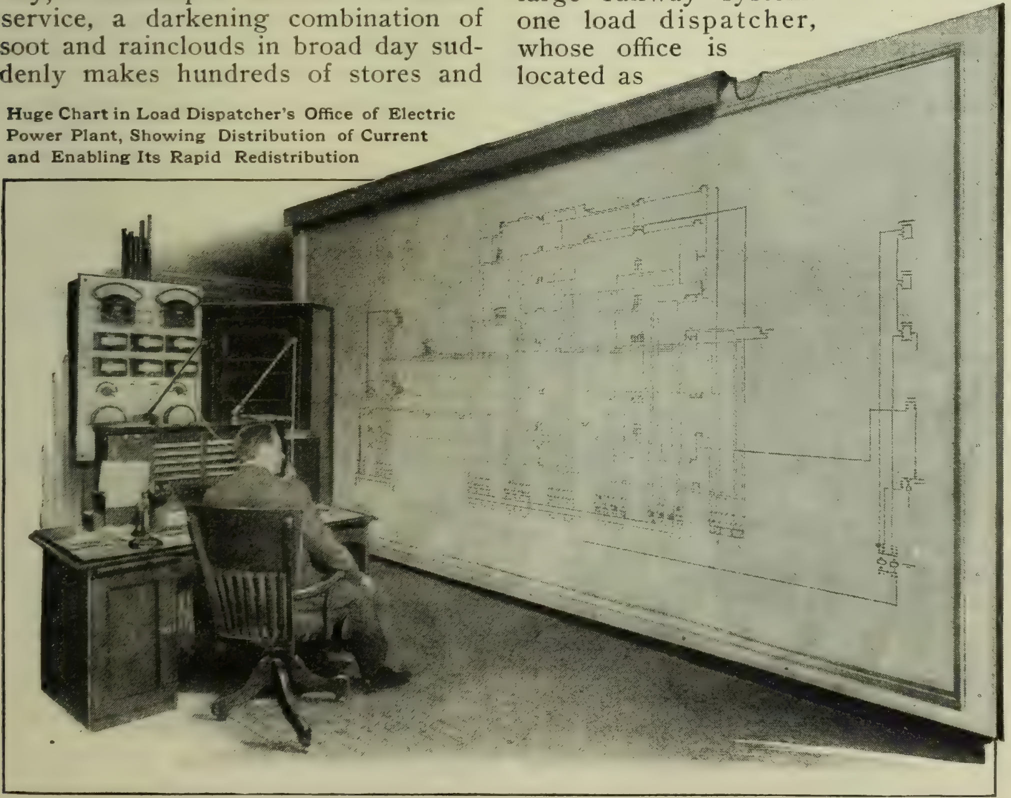
The permanent magnet is used to overcome the necessity of having direct current to magnetize the field.

HOW THE MODERN JOVE JUGGLES HIS LIGHTNING

It would take an epic by Kipling to do justice to the romance and the might of the "Load Dispatcher," the man who sits at a desk in a big city electric-power station and scatters horsepower by the tens of thousands around the community, who takes away here and concentrates there, as the momentary need requires, such vast forces of electricity that the only comparison to him is the old pagan god Jupiter, hurling his thunderbolts.

A great fire rages in one part of a city, and disrupts the entire electrical service, a darkening combination of soot and rainclouds in broad day suddenly makes hundreds of stores and factories seek electric light, a whole power station goes out of commission from some accident, a snowfall brings traction lines seeking immediately for some power help, and the load dispatcher sits at his desk, shifting to the required points the thousands of kilowatts at his disposal.

In a general way, a large electrical generating, transmission and distribution system, such as that operated in Chicago by the Commonwealth Edison Company, is controlled much as a large railway system. The one load dispatcher, whose office is located as



Huge Chart in Load Dispatcher's Office of Electric Power Plant, Showing Distribution of Current and Enabling Its Rapid Redistribution near the center of the system as possible, is at all times in direct charge of the generation as well as of transmission and distribution by means of a sort of private exchange with direct wires to all the different stations and substations and for this purpose has telephone connection with every part of the system. In times of trouble, as many as four aids may be pressed into service to handle the numerous calls which then reach the load dispatcher's office.

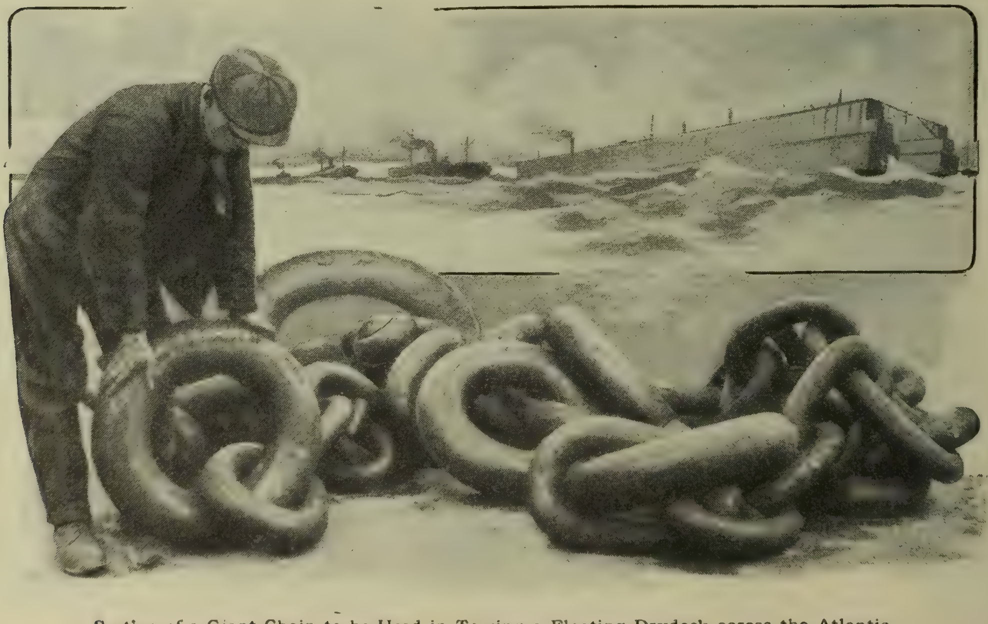
A large paneled board contains diagrams of the entire generating, transmission, and substation high-tension connections. The switches in stations and substations are indicated by small black circles around a small hole, in which a plug is inserted when the switch is closed. If any particular line is in operation, a red tag at the switch is used to indicate that condition.

No generator, line, or switch is closed or opened without a direct order from the load dispatcher, except in emergencies, nor is any work allowed on any part of the system without a permit from him.

Distribution feeders are shown on separate maps, a great number of which, covering practically every portion of the city, are on file for ready reference. A glance at these will tell the load dispatcher the probable extent to which any trouble may grow, and enable him to take immediately such protective measures as are necessary. Other conditions of all the branches of the system are similarly indicated by means of various recorders and meters.

GIANT CHAIN FOR TOWING DRYDOCK ACROSS OCEAN

A giant chain, formed of some of the largest links ever made, was recently constructed in England for use in towing the huge floating drydock "The Duke of Connaught" across the Atlantic to Canada. This floating dock is the second largest in the world, and is capable of taking the largest battleship being built or projected. It is 600 ft. in length, 105 ft. wide, and 60 ft.



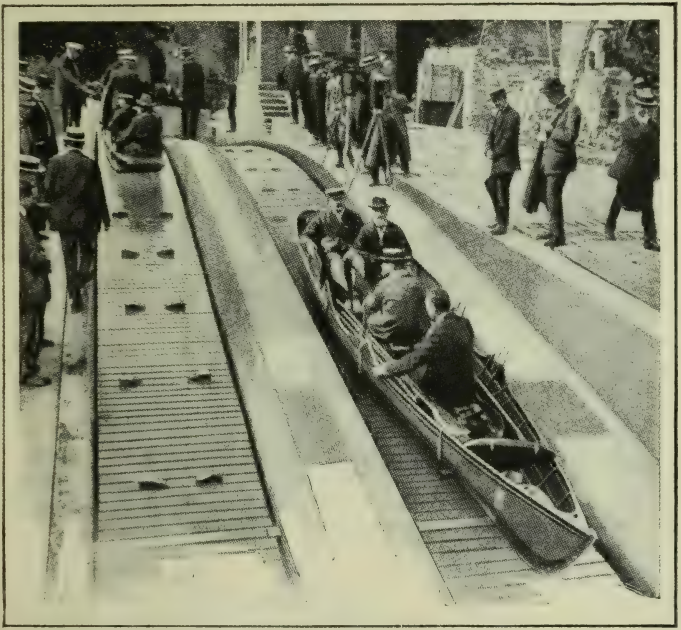
Section of a Giant Chain to be Used in Towing a Floating Drydock across the Atlantic deep. The trip across the Atlantic will probably take six weeks to two months.

THE LIMIT OF AEROPLANE DIMENSIONS

Comparison of aeroplane sizes with the dimensions of the great dirigible balloons of Germany and other countries has recently provoked considerable discussion in European engineering circles, as to the possible maximum of aeroplane sizes. And, among other things, it has been held that the relatively small size of the aeroplane must, when the expected era of commercial application dawns, place it at a serious disadvantage in comparison with the giant gasbags, with present capacities ranging up to 25 passengers. Against this, however, it is argued that the vehicle of moderate capacity has a distinct field of its own, which, because of the involved emancipation of its passengers from other persons' routes, stops, and schedules, is one of the highest importance. And, in this connection, the automobile is cited as an example of high utility that may attach to the small-unit vehicle. Much speculation, nevertheless, has been aroused, with the result that the present consensus of European engineering opinion seems to be to the effect that, with present structural materials, it will be possible, as soon as it is considered desirable, to construct aeroplanes of a wing spread of 100 ft., a weight of 5 or 6 tons, and of a capacity to carry in comfort from 10 to 20 passengers. So far the aeroplane size record is held by the 60-ft. Cody biplane which weighs 3,000 pounds.

ELECTRIC CONVEYOR TAKES BOATS OVER LOCKS

At Boulter's Lock, on the River Thames, England, which is particularly congested with punts and other types of small boats during regatta weeks and week-ends, has been installed an electric conveyor which carries these small craft, occupants and all, from one level to the other. There are two conveyors, moving in opposite directions, and it only takes a minute to pass from one level to the other. The conveyors run on the same principle as moving stairways.

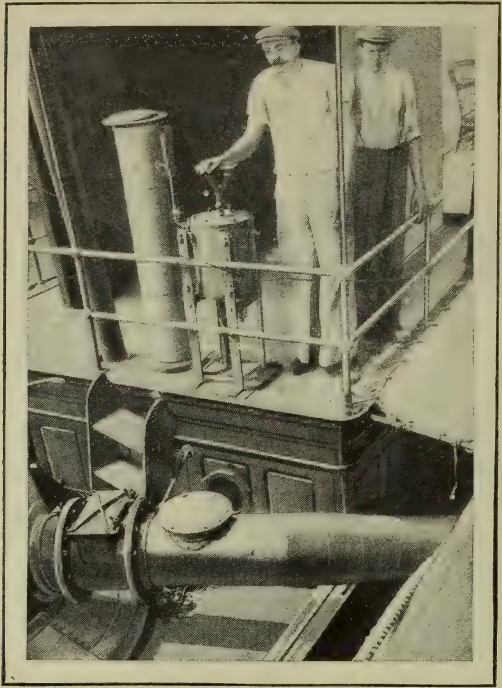


Small Boats Carried Over an English Lock by Electric Conveyors

SCIENTIFIC RAT KILLING IN BOSTON HARBOR

The steamship "Bratton," of the United States Marine Hospital Service, equipped with the rat-killing apparatus invented by an Australian chemist, is being used in the rat-killing campaign in Boston Harbor. The "Bratton" ties up alongside the sugar and banana boats from South America and the West Indies and pours into them the gases which exterminate every rat in their holds.

The method invented by the Australian, and originally intended for fighting fires in the holds of vessels, consists of drawing out the gases which ascend through the funnels of a steamship from the fires, modifying them slightly and pouring them into the hold of the vessel under treatment. These gases contain no oxygen and gradually drive all the air out of the vessel's hold. The rats die for lack of oxygen, and, in case of fire, the latter is extinguished for the same reason.



The Rat-Exterminating Apparatus of the U. S. Marine Hospital Service Ship "Bratton"

Under a recent government order rats must be killed on ships arriving not only from the West Indies and South American ports, but from Africa, Russia, China, India, and the islands of the Pacific where bubonic plague has been found at one time or another.

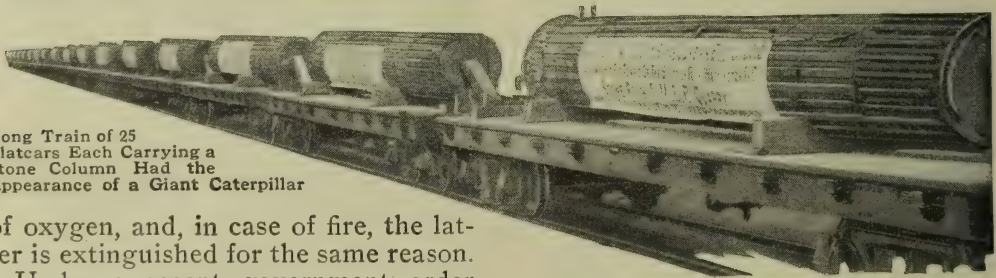
ACETYLENE HEADLIGHT WITH THREE BURNERS

A manufacturer of acetylene headlights for automobiles has designed a burner which provides three individual flames, all of which are spaced the same distance from the reflector, and also at the same height. The purpose of the triple burner is to utilize the whole surface of the headlight reflector. Valves are provided to open or shut off the flow of gas to each of the side burners, a feature which permits the regulating of the amount of acetylene used according to the operating conditions.

COLUMN-CARRYING TRAIN LIKE HUGE CATERPILLAR

When a train composed of 25 flatcars, each of which carried a limestone column, 40 ft. in length and 5 ft. in diameter, pulled into one of the freight stations in Washington recently, it closely resembled a huge caterpillar or sea serpent winding its way along the roadbed. There was but a short space between the ends of the columns and when the train moved swiftly it looked like one continuous piece of stone 1,000 ft. long.

The columns are to be used on a colonnade which is to adorn the magnificent Scottish Rite Temple now in course of construction. Thirty-three columns are to be used, the number being symbolical of the 33 degrees of



Long Train of 25 Flatcars Each Carrying a Stone Column Had the Appearance of a Giant Caterpillar masonry. Each column weighs about 30 tons. They are of Indiana limestone and came from the quarries of Bedford, Ind.

TO SIMPLIFY SYSTEM OF PAPER MONEY

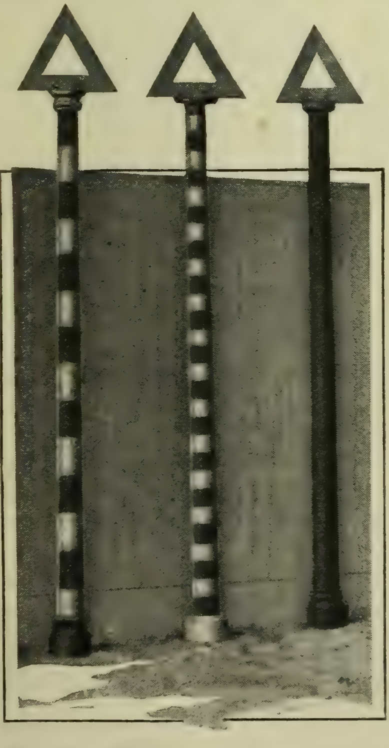
If the Secretary of the Treasury carries to completion his present plans, paper money will be so systematized that the denomination of a note can easily be determined at a glance. The idea is to make each bill with a distinctive design.

It was at first thought that making the different bills of different colors would suffice, but it was afterward determined that no scale of colors could be devised that would withstand the manipulations of a clever chemist. Therefore the idea of different designs was born. Secretary MacVeagh believes that the present currency contains too many designs. He would simplify the system and reduce the number. The new currency will have very plain figures so placed within a white space, and so arranged that the one-dollar bill, the ten-dollar, the twenty-dollar, or one-hundred-dollar bills will readily be recognized.

The experimental plates for the new currency are to be made one-third smaller than the present issue. It is the opinion of treasury officials that such bills will save the government about one million dollars a year.

TESTING COLOR SCHEMES FOR SIGN POSTS

On a hill at the edge of Wimbledon Common, London, is a row of five sign posts, each of which has a different color scheme, two of them being in red and white, two in black and white, and one all red. The posts were placed there by the London Roads Improvement Association, and will remain in position for some time to test their relative visibility by day and night. Motorists and other road users are requested to let the association know which of these color schemes seems to them the most adequate.



Sign Posts Set Up in a Row, to Test the Relative Visibility of Their Different Color Schemes

ℭThe rain and snowfall in the United States in one year would weigh six trillion tons declares a government scientist.

THE INCUBATOR OF THE BRUSH TURKEY

The brush turkey antedated man by many thousands of years as an inventor of the incubator method of hatching eggs. This bird, which belongs to the mound builders, is a native of Australia. A flock of these birds construct a common nest about 6 ft. high and from 10 to 12 yd. in diameter, composed of a heap of soil mixed with decaying leaves and twigs. A hole is then scraped to the center of the mound and the hens of the flock deposit eggs to the extent of a half bushel or more. Then the hole is covered up, in course of time the heat generated by the decaying vegetation hatches the eggs, and the turkey chicks wriggle out of the mound into the sunlight.

AVIATION SICKNESS

By JOHN B. HUBER, A. M., M. D.

There is a new disease—aviation sickness. Seasickness is a terror to most of those who venture upon the ocean; should aviation gain many votaries, air sickness is likely to be an even more miserable and a much more fatal illness. Almost everyone who has dared stand on the edge of a precipice and look into the yawning depths below has realized Poe's meaning in his story "The Imp of the Perverse": as if a dreadful impulse were prompting a leap to death down into the chasm. Those who have felt this way will have an idea of the nature of aviation sickness.

People speak glibly of the probability of general air traffic in the near future; but they do not take into account aviation sickness, which has probably been the reason for many of the fearfully numerous deaths among airmen.

To be stricken in this way is to lose control of the machine. There is nausea, with a swimming sensation and giddiness; frontal headache; the dread of falling; a desire to go to sleep; perhaps a lapse into unconsciousness: and after that, of course, all is over.

The turning of sharp circles while descending is likely to bring on dizziness, with palpitation of the heart and rapid pulse. Blood pressure is very greatly increased by any swift flight in the air; such was found to be the case even among airmen who were athletes in full training. The heightened blood pressure is also due to the sudden descent to earth, which is often made in one-fourth to one-fifth the time required in ascending. Such swift descent induces functional insufficiency of the heart; the circulation does not have time to become adapted to the change of pressure. There is also the dangerous fatigue of the circulatory apparatus caused by high flying, in rarefied atmosphere, which provokes irregular heart action, with vertigo.

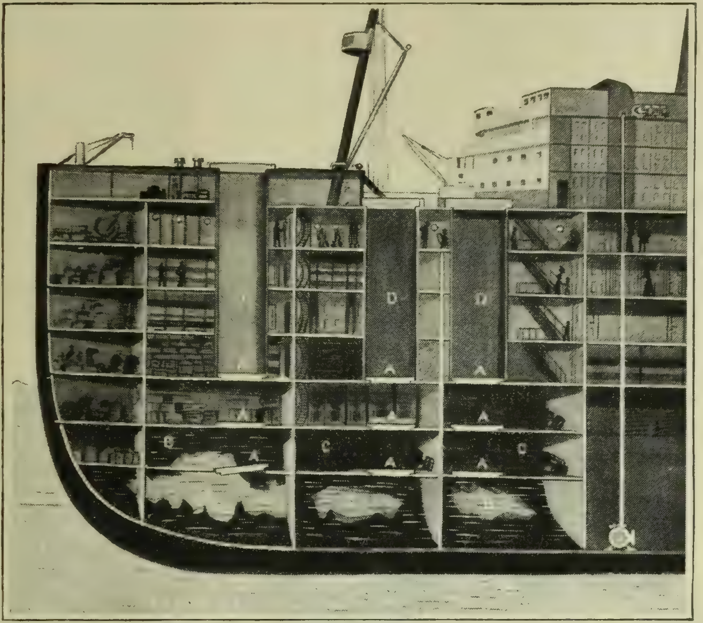
Thus, a sound heart and supple arteries are absolutely essential in the airman who would not court disaster and untimely death. Safety often lies in height, because the airman, in case of accident, gets time to control his machine. Yet a sudden plunge from a height of several thousand feet is likely to strike the aviator unconscious, and thus to seal his doom. For example, the body of Maloney in California, in 1905, showed no broken bones or bruises sufficient to have caused death; evidently he was stricken with heart failure, and died during his descent.

Other manifestations of air sickness are: a sensation of intense cold; loss of control of the body reflexes; irregularity in the movements of the voluntary muscles; and aberrations which are probably the expression of the combined effects of cold, accelerated heart beat, nervous tension, fatigue, and the brave man's fear; which latter is a deplorable phenomenon.

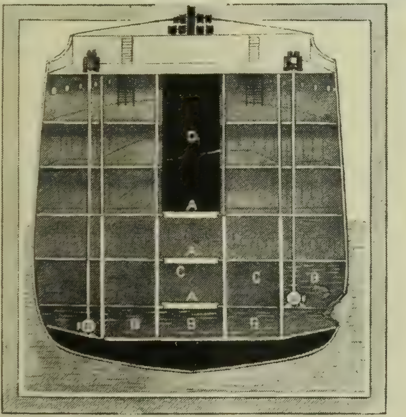
Airmen, on landing, have spoken of an intense sense of warmth over the whole surface of the body: the face is flushed; the eyes "sting." There is almost invincible desire to sleep. Some of the symptoms noted in caisson workers find a counterpart in those reported by airmen.

Obviously, then, only fit men should take to the air; and even for such there is great risk. Nor is aviation for the foolhardy. Flights call for continuous effort, both physical and psychic, under conditions altogether unfamiliar to humankind before our generation—conditions to which the human organism is not as yet well adjusted. By way of prevention of all-too-frequent deaths, some system of automatic stability should, if possible, be invented, so that an aeroplane will not dive to earth should the airman be stricken with illness during his flight. A parachute, or a parachute garment should be part of every airman's equipment.

WATERTIGHT DECKS TO RENDER SHIPS UNSINKABLE

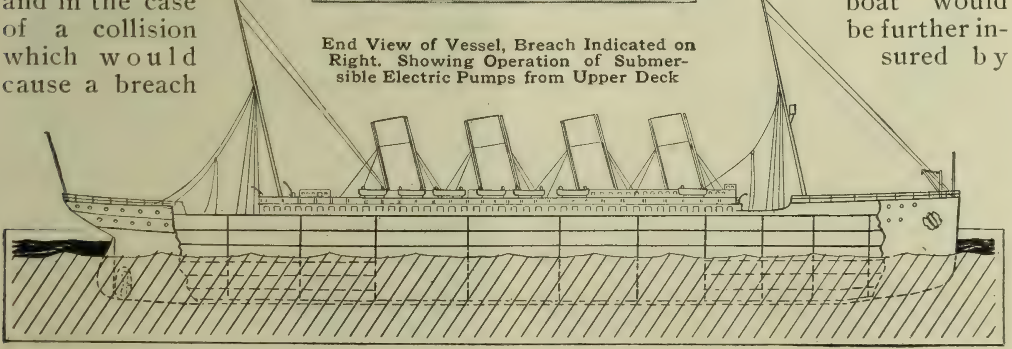


Side View of Ship Equipped with Watertight Decks; A, Watertight Hatches in Watertight Decks; B, Compartments Flooded; C, Compartments Protected by Watertight Decks; D, Hatch Shaft



End View of Vessel, Breach Indicated on Right. Showing Operation of Submersible Electric Pumps from Upper Deck

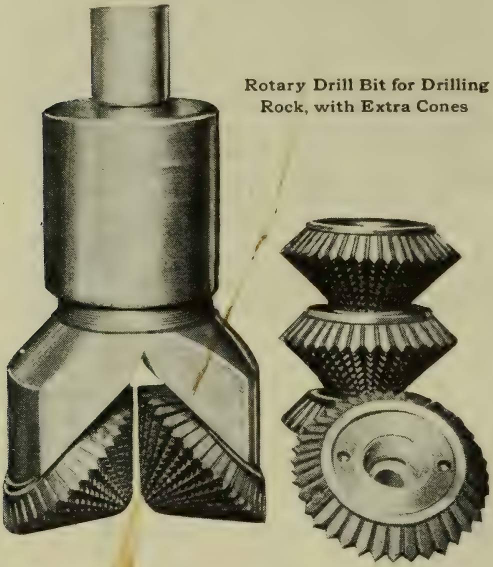
The unsinkable ship continues an unsolved problem though many inventors are searching for its solution. The accompanying illustrations, reproduced from the Sphere, show what might be accomplished by watertight decks, a method for rendering boats unsinkable now being considered by the Bulkheads Committee of the British Board of Trade. Watertight compartments having failed in the notable case of the "Titanic," the watertight deck is proposed as a means of providing a new bottom for a vessel which has suffered a puncture below the waterline. It is not the purpose, of course, to make the upper decks watertight but only those lower decks which carry cargoes of freight. As at present constructed the great liners have a double bottom and in the case of a collision which would cause a breach in a vessel of the type shown in the illustration, dependence could be placed not only on the existing double bottom but also upon the three watertight decks above. The stability of the boat would be further insured by



Side View of Vessel Showing That with Lower Decks Flooded, New Bottom is Provided at Water Line by Watertight Deck the employment of submersible electric pumps, operated by engines on the upper deck, which would force compressed air into the flooded portion of the ship and add buoyancy to the boat until relief was obtained.

ROTARY DRILL TO BORE ARTESIAN WELLS

For sinking oil and artesian wells through hard rock a new rotary drill bit, the invention of a Texas oil producer, is coming into very general use. Instead of scraping its passage through rock as did the old one-piece bits, this new instrument crushes its way downward at a rate many times that of the old bits.


Rotary Drill Bit for Drilling Rock, with Extra Cones

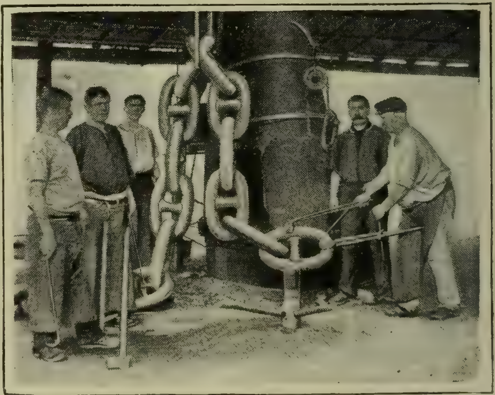
The illustration suggests at once how the bit accomplishes its work. When rock is encountered the dirt bit is replaced by the rock bit which screws onto the pipe by means of the large collar. The pipe revolves with its total weight resting on the rollers. These are thus made to turn by friction, and their hard steel teeth powder the rock beneath rapidly. The flow of water downward through the pipe and up on the outside washes away the powdered rock as fast as it is produced. A small pipe inside of the collar contains lubricating oil and a metal float which forces the oil through canals to the cones. The hardest alloy steel is used in manufacturing the bit. The cones are easily removed and replaced with new ones when they have become worn.

SPANISH TOREADOR BECOMES AIRMAN

That aeroplane exhibitions are becoming more and more popular in Spain might be deduced from the fact that one of the foremost toreadors in that country, Mazzantini by name, has abandoned the arena for the air. He recently started training for a license as an air pilot, this profession offering, in his estimation, far greater difficulties and dangers than his former occupation. Also, he apparently believes that the new sport offers more chance for monetary gain than the old.

FORGING LINKS OF GIANT ANCHOR CHAIN

The giant anchor chains for ocean liners are forged link by link, the slowly growing lengths of chain being handled as shown in the accompanying illustration.


Forging the Links of a Giant Chain for Ocean Liners

A chain-making gang consists of a foreman and four assistants, the latter operating the furnace, hammering the links into form, and operating the hoist which shifts the chain as link after link is added. The foreman is shown holding the link in place.

NIGHT SHELTER PROVIDED FOR MOTOR TRUCKS

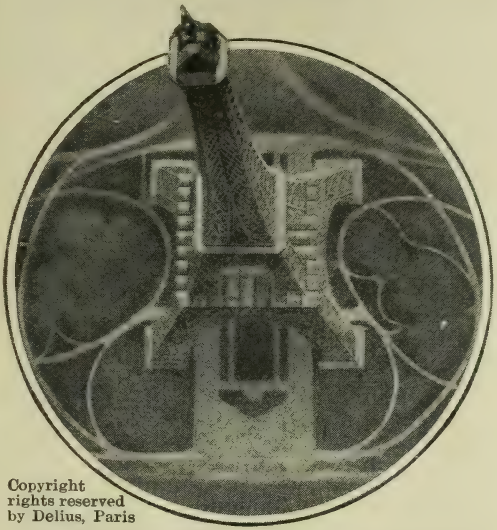
The notable increase in the use of motor trucks and other commercial vehicles propelled by steam and gasoline, on long trips in England has led to a concerted movement for the accommodation of the vehicles, with their drivers and helpers, at night. It is now announced that, through the coöperation of municipal and county officials, cattle markets and other public places in many towns will be utilized as night stands.

MINE OPERATED WHOLLY BY ELECTRICITY

Mule power is to be entirely eliminated in a coal mine at Christopher, Ill., when its new plant has been installed. Electric power will be used exclusively and about half the capacity of the plant will be required for the electric hoist, which will be the largest in use in the country. The hoist will carry a load of 9,000 lb. in a car and cage, the combined weight of which is 11,000 lb. The equipment will provide for 1,000 trips from a 600-ft. depth in seven hours. As the mine company intends to discontinue the use of mules in its largest colliery, it has ordered, to replace the animals, 32 six-ton electric mine locomotives. A number of the locomotives are arranged for tandem operation so that, in case of breakdowns, substitutions can be made. The ventilating fan will be driven by a 250-hp. motor; and for operating the conveyors, shaker screens, picking tables, pumps, etc., several small motors ranging from 10 to 50 hp. will be installed.

THE EIFFEL TOWER FROM AN AEROPLANE

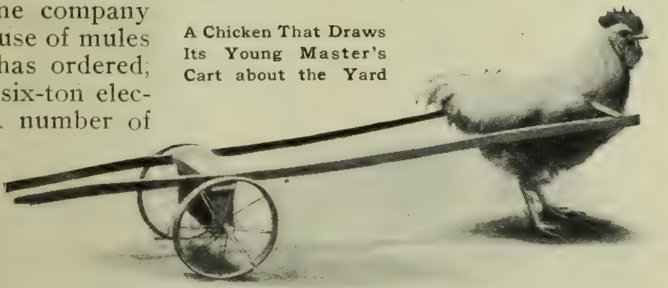
An excellent "air-eye" view of the famous Eiffel tower, Paris, taken from an aeroplane flying above it, is shown in the accompanying illustration. The summit of the tower as well as the huge base supports and the gardens surrounding it, are quite clearly visible.


Copyright rights reserved by Delius, Paris

The Eiffel Tower "Snap-Shotted" Downward from an Aeroplane

CHICKEN DRAWS A CART

That chickens may, with a great deal of persistent effort, be developed into entertaining pets for small boys is shown by the accompanying illustration. This cock, probably no more intelligent than any other of its species, was trained by a certain small boy to draw a miniature cart about the yard.


A Chicken That Draws Its Young Master's Cart about the Yard

U. S. GOVERNMENT SAVES ON SULPHURIC ACID

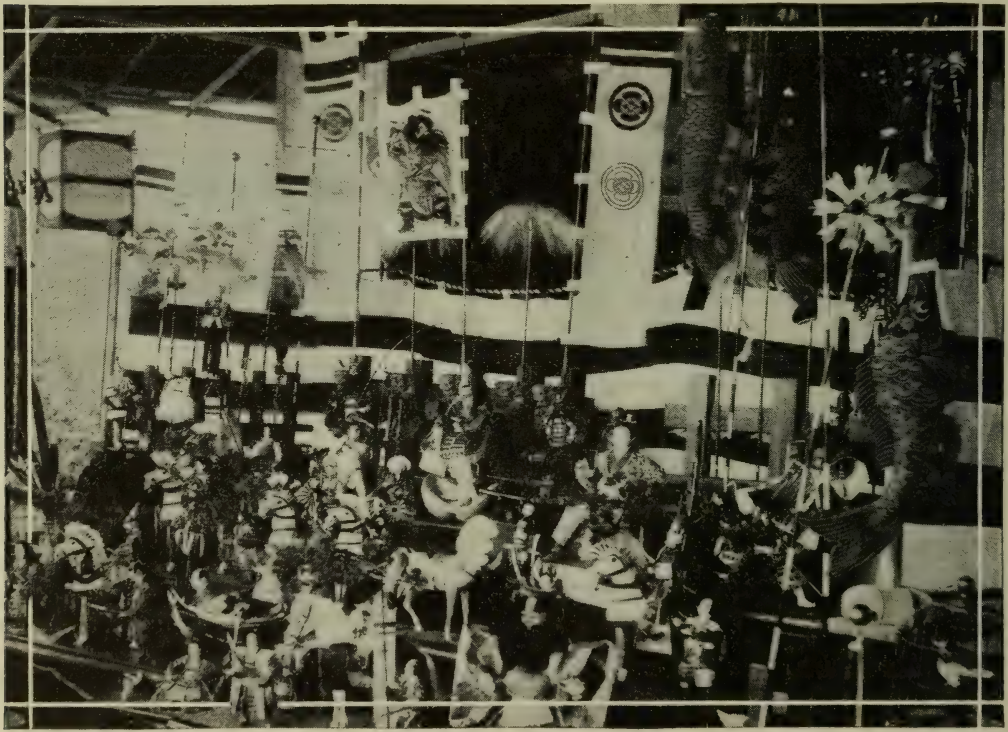
The government, in its Maryland plant for the manufacture of smokeless powder, has found recently that it saves money in the manufacture of sulphuric acid by paying more for the raw materials. Cheap iron pyrites from New York and Virginia were formerly used for the purpose, but now Louisiana sulphur has taken its place.

When iron or sulphur pyrites burn in air they form the same offensive and poisonous gas that is produced by the burning of an ordinary match, and known as sulphur dioxide or sulphurous acid. By heating this gas, and then passing it over hot, finely divided platinum, so-called platinum sponge, in the presence of air, a substance is produced which, when dissolved in water, gives the ordinary commercial sulphuric acid.

The objection to the cheap sulphur, in the form of pyrites, is that the arsenic, which is also present in the pyrites, poisons the costly platinum, unfitting it for further use in the process. The more expensive native sulphur, on the other hand, contains no arsenic, the platinum therefore lasts practically indefinitely, and the cost of sulphuric-acid manufacture is greatly reduced.

TOYS WITH A MEANING

"The tange," or fifth day of May, is the annual boys' festival of Japan. Each household which has been favored by the birth of a male child during the past year flies a large paper carp at a staff, and indulges in a display of toys representing every real and legendary trade, craft and calling with exacting fidelity, so far as the financial situation of the family permits. The carp denotes courage, perseverance and will power, which the male child is supposed to possess, and the toys are supposed to indicate his interest in the activities of life. The iris and the sweet flag are the flowers of



Display of Toys for Boy in Wealthy Japanese Home on Annual Boys'-Festival Day the month and these are included in the toy display of each household. At this time older members of the household drink sake seasoned with iris petals.

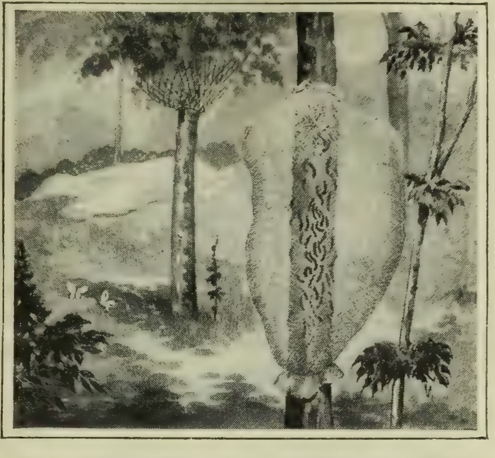
FABRIC RESEMBLING CLOTH MADE FROM PAPER

Paper yarn and woven paper fabrics have long been manufactured in China and Japan, but their production is now becoming quite an industry also in Germany, where special spinning machines with as many as 100 spindles—a slightly modified type of the ordinary cotton-spinning machine—are made for the purpose. The paper is fed to the machine in ribbons of various widths and strengths and, before reaching the spindle, it passes through a device in which it is moistened to a different degree for different purposes. Dye stuffs can, of course, be added to the water in order to color the paper at the same time.

The uses of the paper yarn are many, especially for such woven fabrics as are not exposed to moisture, although it is possible to waterproof the yarn by treatment with gelatine. Woven wall paper, bags for purposes where odorless packing is required, table covers, draperies and mats are some of the articles produced. It is said that these paper fabrics retain dust much less than woolens, besides, of course, being much cheaper. As paper retains dye very well, colored articles will not fade as quickly as woolen or cotton articles. When calendered, woven paper-yarn fabrics can scarcely be recognized as such at a cursory examination.

A BUTTERFLY FARM

One of the most curious farms in England is devoted entirely to the raising of butterflies. This farm, covering three acres of land on the outskirts of Bexley, Kent, England, and providing its owner with a profit of about $2,500 a year, presents a somewhat peculiar appearance. All the land is covered with bushes, undergrowth and saplings, with a few big trees, and nearly every young tree and bush is enveloped in huge bags of gauze, or hanging zinc cages, while many clumps of trees are entirely surrounded by wire netting as a protection from birds.



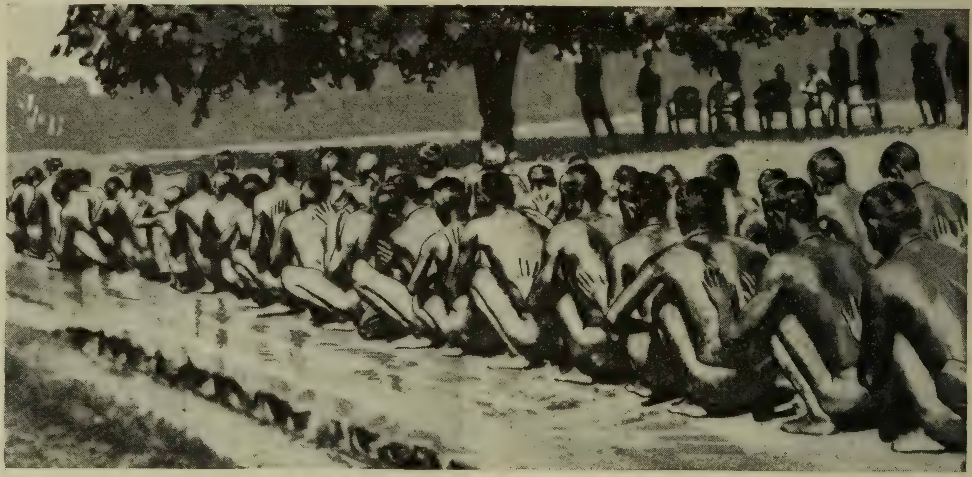
Gauze Nets around Trees on Butterfly Farm Keep the Caterpillars from Escaping

On this jungle farm are raised every sort of British butterfly and moth. The owner sells upward of 30,000 preserved insects a year at prices varying from a few cents to $50. Schoolboys and well-known collectors form the bulk of the patronage.

DOPING THE SOIL TO MAKE FLOWERS THRIVE

Potassium permanganate, a chemical that is commonly used as an antiseptic or disinfectant, and may be purchased at any drug store, is found beneficial under certain conditions in flower culture. If, for instance, the sweet peas do not thrive, the soil will often be benefited by spraying or sprinkling with a solution consisting of one ounce of this chemical to six ounces of water. The potassium permanganate kills some of the injurious organisms in the soil, and is also especially effective in killing the green fly which infests rose bushes.

Care should be taken, however, not to make the solution stronger than the proportions mentioned.



Courtesy the Sphere, London

Tit-for-Tat: Lines of Native Prisoners in British India Massaging Each Other's Backs

COOPERATIVE MASSAGING IN INDIAN JAIL

Probably the most amusing sight connected with the native jail at Agra, British India, has to do with the cleanliness of the prisoners. Fettered at the ankle and carrying little brass implements, they march to a long water trough or channel, face about, wash their loin clothes and themselves, and then squat in rows as shown. Each one then proceeds vigorously to massage the back of the man in front of him, then a swift right-about turn takes place, and the massaging is continued. The man at the head and the man at the tail of the line get only one rubbing instead of two, but this is compensated for by the fact that these men only have to rub once.

SEEKING A PRACTICAL NON-"PHOSSY-JAW" MATCH

The horrible disease, "phossy jaw," which commonly afflicts workers employed in making the ordinary phosphorus match, is of so serious a nature that legislation in many of the European countries prohibits the manufacture of this match.

The type of match commonly known as the "safety" match, which must be scratched on the side of the box to be ignited, is, so far, the only match that is noninjurious to the workers and at the same time may be considered at all practical. In these matches, the poisonous yellow phosphorus is replaced with the harmless red phosphorus. This red phosphorus, however, is on the cover of the box, and the safety match cannot be ignited without the box. It is only within a very short time that the red phosphorus has been used in matches that "strike anywhere," but so far this type of match has not proved practical. They produce more smoke, and are harder to strike than the ordinary match.

Other safe forms of phosphorus are scarlet phosphorus, and compounds of phosphorus with sulphur. The latest compound, invented last year, is made by heating together, at 150 deg. F., red phosphorus, sulphur chloride, and the sulphide of some metal.

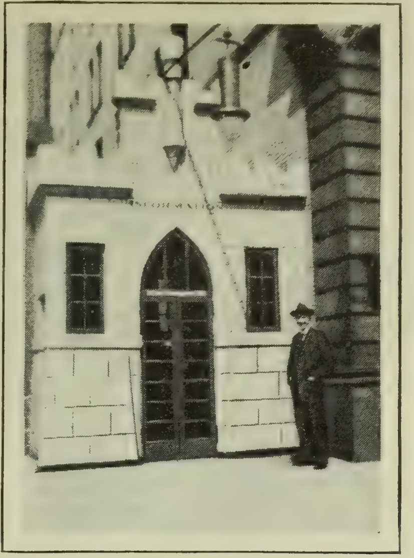
The ideal nonpoisonous match has yet to be invented, but it will probably be realized in the next few years. Such a match should light easily, but not so easily as to start fires of itself; it should give off no injurious vapors in its manufacture; must not be affected by dampness, and should be as sensitive to friction as the poisonous double-tipped match.

LOCOMOTIVE FIREMEN GIVEN INDIVIDUAL SHOVELS

The locomotive firemen employed on the Iowa division of the Chicago & Northwestern Railroad, are provided with individual shovels, which, when not in use, are kept locked in a special storage rack at the roundhouse. The idea of such an arrangement may seem to the average person to have no reason, but it is a psychologically well founded feature of a fuel-economizing scheme. A baseball player can bat better with a bat familiar to his hand than with a strange one. Similarly, many mechanics have a preference for some accustomed tool, and it is just the same with the fireman and his shovel.

"FORT" FOR INFORMATION BUREAU

"Fort Curtin" is the name given the castellated structure shown in the accompanying photograph. It was erected at Altoona, Pa., for use as an information bureau during the semicentennial celebration of the "loyal war governors' conference" held in that city, September 24 to 26. The miniature fort was named in honor of Andrew Gregg Curtin, governor of Pennsylvania in 1862, who called a conference on September 24 of that year, at Altoona, of 14 loyal governors who there pledged support to the national government in the civil conflict.

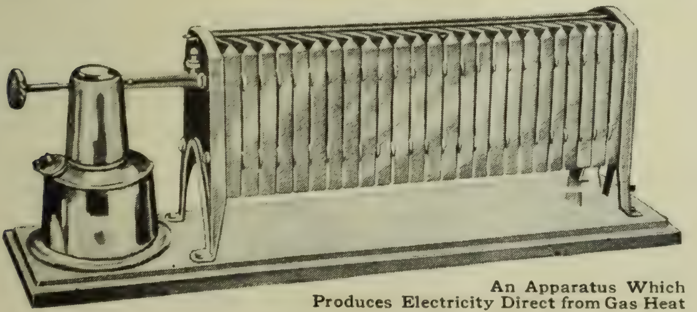


This Miniature Fort, Erected at Altoona, Pa., Served as an Information Bureau

ℭThe great Krupp works, the largest steel plant on the European continent, were founded in 1810 as a small forge worked by water power at Essen.

ELECTRICITY DIRECT FROM ARTIFICIAL HEAT

It has been known for several decades that electricity can be generated by the heating of certain metals in contact with each other, forming the thermoelectric couple or thermopile. Various forms of thermoelectric generators have been devised for the generation of electricity from gas heat, but the amount of current so obtained has been exceedingly small.



An Apparatus Which Produces Electricity Direct from Gas Heat

In the accompanying illustration, however, is shown a unique thermogenerator which is said to be practical in form. It comprises two generator plates with two rows of hollow copper tubes placed vertically between them, and generates an electric current from heat supplied by a gas burner or an alcohol lamp. A storage battery of 2 to 4 volts is charged by it, and it is used to provide a steady current for light cautery work and for surgical electric lamps.

METALS MADE POROUS BY NEW PROCESS

By means of a very simple and ingenious process, a professor of the Copenhagen, Denmark, Polytechnic Institute has succeeded in producing metals of a porous consistency which give promise of interesting applications in various industries.

He has made a porous or spongelike form of lead which has already been found useful in storage batteries in place of the solid lead plate. Widening the scope of his investigations, he has also been successful in filling the cavities of the porous metals with various nonmetallic substances, as resin, fats, enamels, etc., thus producing a material which would find many practical uses. Bands or wires of porous tin, for instance, may be impregnated with resin for use in soldering; bearings impregnated with oil, for lubrication, and so on.

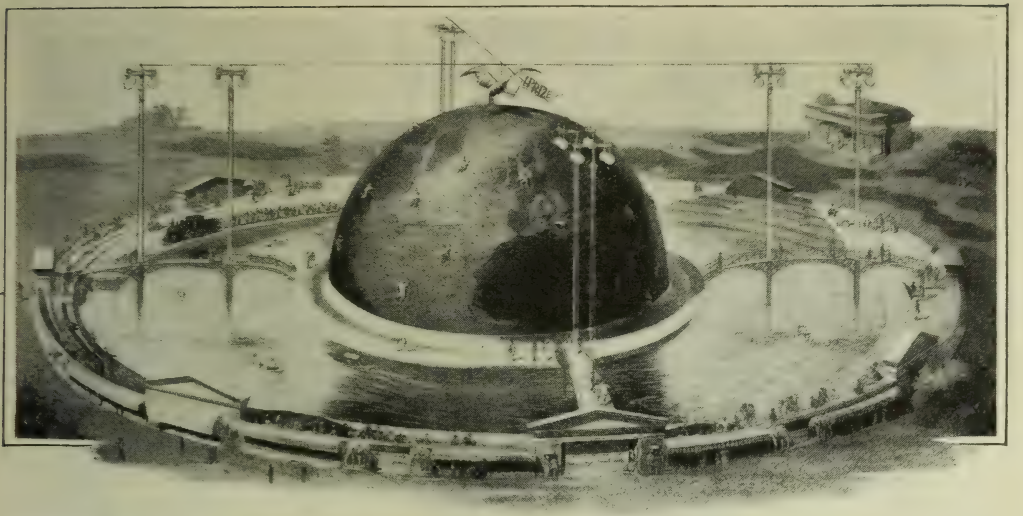
The production of the porous metal depends on the fact that solidification of melted alloys does not take place at once, but is protracted over a longer or shorter period of time. An alloy consisting of equal parts of lead and antimony, for instance, commences to solidify at about 840 deg. F., when crystals of antimony begin to form. These crystals increase in size until the temperature falls to about 430 deg. F., at which point the remaining part of the alloy, which now contains 87 parts lead and 13 antimony, solidifies entirely, forming a mass of very fine crystals of both metals. This part of the alloy, which has the minimum fusing point and a constant temperature of solidification, is called "eutectic alloy." After complete solidification, the alloy consists of large crystals formed between the temperatures of 840 and 430 deg. F., which together make up a sort of framework, in the canal-like interstices of which the eutectic alloy is deposited. At temperatures intermediary of 840 and 430 deg., the alloy is more or less plastic, consisting of solid antimony crystals surrounded by a still liquid alloy. This liquid alloy is blown out with a compressed non-oxidizing gas such as carbonic acid, for instance, or with oil, or, still better, by the action of centrifugal force in a special apparatus. Thus the antimony sponge is obtained, the volume of its pores depending on the relative proportion of the two metals in the initial alloy and the temperature at which the liquid part is blown out.

By starting with an alloy of 90 parts lead and 10 parts antimony, lead sponge is produced. With 80 parts tin and 20 parts lead, tin sponge results. Porous copper or silver may be produced by an inverted process. To accomplish this the pores of a lead sponge are electrolytically filled with a copper or silver deposit and the lead is then eliminated in a centrifugal machine at a temperature slightly above the fusing point of lead.

SEEKING THE NORTH POLE IN AMUSEMENT PARKS

Globe circling is the popular diversion proposed for visitors of the Panama-Pacific Exposition by a Chicago inventor of an amusement device. One will no longer need to make elaborate preparations for a round-the-world journey, but need only go to the nearest amusement park and there take a trip to the north pole.

This extraordinary feat of travel is accomplished in a short time by the person taking the trip—for he simply climbs upon a freely rotating globe of large dimensions which is set in a hemispherical pit of slightly larger diameter than the globe. The globe moves in the pit on a series of ball bearings, or may be simply floating in some suitable fluid that fills the narrow space between the globe and its holder.



Copyrighted, 1912, by Allegretti

Globe Which Freely Rotates When Persons Climb Up Steps on Its Sides Seeking the Prize at Top, the Device being Intended for Amusement Parks

This miniature world may be climbed by means of small swivel grips that provide holds for both hands and feet, and are placed at frequent intervals all over the surface. Being sunk into the sphere, these grips form no projections on the smooth surface by which a person sliding off may be caught and hurt. The inventor has also provided means which he believes will prevent injury to a person who falls or is thrown back. This consists of a rubber flap that is attached to the edge of the pit and fits tightly against the surface of the globe, so that no one can possibly be caught between the surfaces, and of a heavy air-cushion bumper around the top of the pit to break the force of a possible fall.

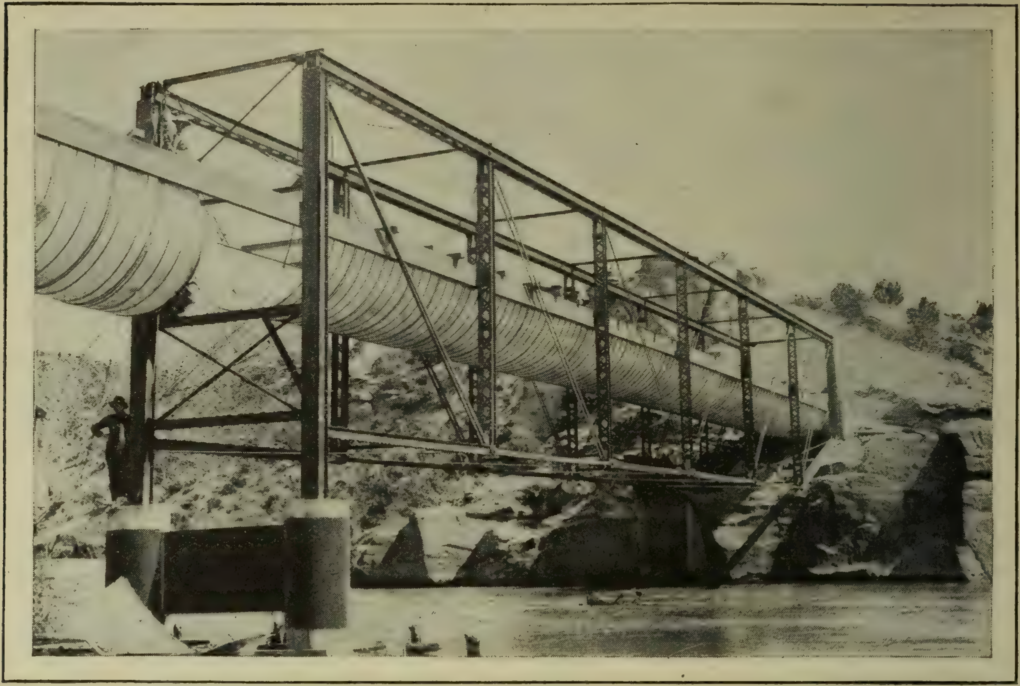
The sphere rotates so freely on its bearings that a man's weight will pull it down on any side, and it would scarcely be possible for a single climber to reach the top or pole, but when a number of persons seek to climb to the top of the globe there is a possibility that someone may reach the goal, which is a flag suspended directly above the center. This flag can be detached by the one fortunate enough to reach it, and it is, of course, intended that the manager of the park should reward the successful performer of the feat with some kind of prize. Outside of the globe and the air cushion and encircling them there will be a groove of polished hard wood into which persons who are thrown back will slide. Or, if the device is placed in a bathing pond, the water will take the place of the wooden groove.

LETTERS DICTATED BY TELEPHONE

When anyone in the offices or different departments of one of the large drygoods stores in New York requires the services of a stenographer all he has to do is to lift the receiver of the telephone and say "stenographer, please," and in a moment he is connected up and dictating the letter.

In the stenographers' room is a special table provided with 10 typewriter positions, five on a side. In the space extending down the center of this table and in front of each stenographer's position is an annunciator and a breast transmitter. The hands of the stenographers are thus left free either to take notes or to write directly on the machine. A switchboard is connected with the table and also with the main switchboard of the store.

The idea saves much valuable time.



Water Carried through This Flume, Suspended by Steel Bridge over a River, Irrigates 25,000 Acres of New Mexico Land

IRRIGATION "DITCH" CROSSES RIVER

An unusual problem in irrigation was solved by the engineer who constructed the bridge shown in the accompanying illustration to carry a flume across the Rio de las Animas, in the vicinity of Aztec, New Mexico. By this means water is conveyed to a 25,000-acre tract of orchard and general farming land which otherwise could not have been reached. On the east side of the river is a high, perpendicular bluff which made it impossible to construct a heading for a ditch at that point. The plan, therefore, was adopted of carrying the water through the suspended flume across the stream from the west side. The steel span is 110 ft. long and is supported on one side by the rock bluff and on the other by steel caissons filled with concrete. The total length of the flume, which is 9 ft. in diameter, is 1,025 ft. The total cost of the flume and bridge was $10,000.

CEMENT GUN USED TO COAT PILES

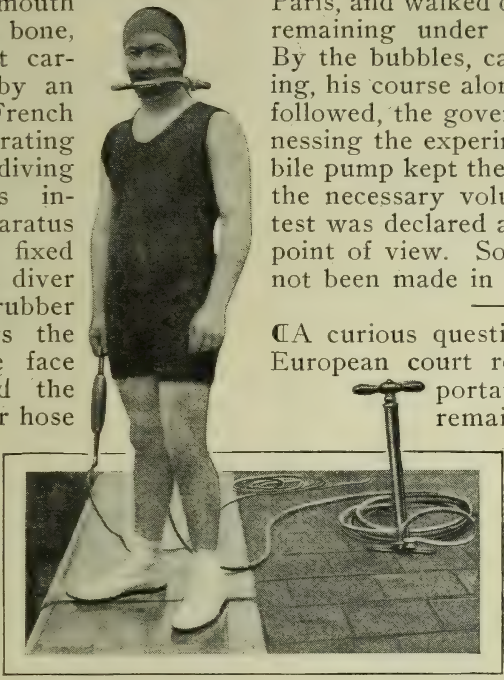
In Seattle, where the harbor piles are subject to the attacks of what is locally termed the "sand flea," the means of protection from this insidious pest, whose real name is the "teredo," has been a troublesome problem. Coating the piles with concrete has proved the best method, but to accomplish this successfully during low tide constituted another problem. This has now been solved by the use of the cement gun. Some 500 piles have been treated in this manner.

Wire mesh of the type used for inclosing poultry yards is first placed around the pile, and a coating of cement from 1½ to 2 in. thick is "shot" on. The cement mixture, or so-called "gunite," sets so quickly that no trouble was experienced from the rising tide.

AN EXTRAORDINARY FRENCH DIVING APPARATUS

To walk into and under the water with one end of the source of air supply clutched in the mouth as a dog clutches a bone, was an experiment carried out recently by an ex-sailor of the French navy in demonstrating the simplicity of a diving apparatus he has invented. The apparatus consists of a tube fixed at the mouth of the diver by means of a rubber band which covers the lower part of the face and passes around the head, a small rubber hose of any desired length, and an air pump of the type used to inflate automobile tires. Teeth grips are provided to help keep the tube in the proper position in the mouth.

With this simple apparatus, the inventor, dressed in an ordinary bathing suit, entered the river Seine, in Paris, and walked out along its bottom, remaining under water 10 minutes. By the bubbles, caused by his breathing, his course along the river bed was followed, the government officials witnessing the experiment. The automobile pump kept the diver supplied with the necessary volume of air, and the test was declared a success from every point of view. So far, the trials have not been made in very deep water.



Dressed Simply in a Bathing Suit, This Man, Provided with Air by an Automobile Pump Attached to Shore End of a Hose and Holding a Special Air Tube in His Mouth, Walked along the Bed of the River Seine, Paris

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ℭA curious question is now before a European court regarding the transportation of corpses, the remains of a German who died in America and whose body was cremated and sent by parcels post to the fatherland having been held up by customs authorities under the rule that it is forbidden to send dead bodies by post.

THE HYDRO-AEROPLANE MEET ON THE ENGLISH CHANNEL

The hydro-aeroplane meet on the English Channel, with headquarters at St. Malo, France, and the Isle of Jersey as the sea end of the specified course, was one of the most important yet held. Eight machines competed in the meet, two of which, a Nieuport model and a Rep, were the first monoplanes of this type. The Nieuport machine, piloted by Weymann, the American airman, took first prize in the flight from St. Malo to the Isle of Jersey and return.

Discussing the results of the meet in so far as they tended to reveal the shortcomings of the present types of hydro-aeroplanes, the French experts conclude that the most necessary improvement would be to increase the stability of the machines on the water. In the air they behave as well as any other aeroplane of the present day. It was the consensus of opinion that when a hydro-aeroplane could be called upon to make such a trip as from St. Malo to Jersey without leaving the water, stopping and starting at will, the problem of the marine aeroplane would be solved.

ℭThe electric fan is said to be slowly putting the "punkah" of India out of existence, one firm in Madras alone reporting the sale of 1,000 fans to replace the "punkah" fans.

LESSONS OF METEOROLOGICAL OBSERVATIONS FOR AIRMEN

By FRANCIS MOLENA

For many years the Blue Hill Meteorological Observatory, supported by, and under the direction of, Prof. A. Lawrence Rotch, has been one of the leading institutions in the whole world for the study of atmospheric phenomena. Box kites carrying self-recording instruments have systematically been used to explore the atmosphere to altitudes of about 12,000 ft., and with sounding balloons, self-recording instruments have been sent to heights of nearly 60,000 ft. As a by-product of the scientific results thus obtained, many things respecting the nature of air currents have been found which undoubtedly will be of great value to aerial navigation. The conditions at Blue Hill will be typical of what may be expected in the whole eastern part of the United States.

The first point to be noted is that the velocity of the wind increases with the altitude above the surface of the earth. Further, the average velocity of the wind depends upon the season of the year. For the first thousand feet it is lowest in summer and highest in winter; but at great altitudes of 5,000 ft. and up to 10,000 ft., the velocity of the wind is greatest in the autumn months.

Perhaps more important than the actual velocity of the wind are the facts which have been learned regarding its steadiness. Irregular atmospheric eddies and changes in pressure, the so-called "air-holes," decrease with increased altitudes. The gusts of wind which have caused so many fatalities in aviation are most frequent at low altitudes with the wind from the northwest.

Another condition under which the atmosphere is particularly treacherous is that in which the cumulus clouds, or thunderheads, as they are commonly called, are forming. These clouds, sometimes to a depth of several miles, develop in large masses of air which, having become heated near the surface of the earth, rise and expand. As the air mass expands, its temperature falls, its water vapor condenses and falls to the earth as rain, usually accompanied by electrical disturbances. Under these conditions air currents are ascending, and consequently the atmosphere is disturbed by eddies, and contains many of the places of low pressure which are so much feared by airmen.

Another subject studied at the observatory is the frequency of winds from the various directions. At all altitudes, the winds from the west, northwest, and southwest are most numerous. But there is a much greater variety in the direction of the wind in the first 3,000 ft. than at greater altitudes. East winds are generally confined to strata of air near the surface of the earth. Under these conditions, especially at the level at which the two layers pass one another, the atmosphere is liable to be badly disturbed. For the first thousand feet, about 50 per cent of the winds are from the southwest, west and northwest; but at a height of 10,000 ft., 86 per cent of the winds are from these directions. It follows that the cross currents are least frequent when the surface wind is approximately from the west.

The practical results may be summarized in the statement that, in order to secure steady atmospheric conditions, it is advantageous to fly at a considerable altitude above the surface of the earth; that the summer is the time when the air is most steady; that the conditions when thunder storms are developing are unfavorable; and that, on the whole, the atmosphere is steadiest when the wind is from the west blowing with moderate velocity.

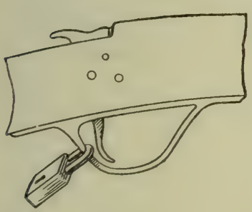
¶Trials are to be held in Paris of a splashguard for automobile wheels which will prevent the splashing of mud from motor-car wheels, a prize of $400 having been offered.

Protecting the Fingers from Chemicals

The finger nails and fingers may be easily protected from stains of chemicals by coating them with a wax made up as follows: Melt white wax in the same manner as melting glue. This may be done by cutting the wax into small pieces, placing them in a vessel and setting the vessel in boiling water. To each ounce of melted wax thoroughly stir in 1 dr. of pure olive oil. The fingers should be dipped into the wax while it is in a liquid state. This will form a coating that will permit the free use of the fingers, yet protects the skin from the chemicals. This method is especially adapted for photographers.—Contributed by F. H. Tillotson, Sycamore, Ill.

Locking a Gun

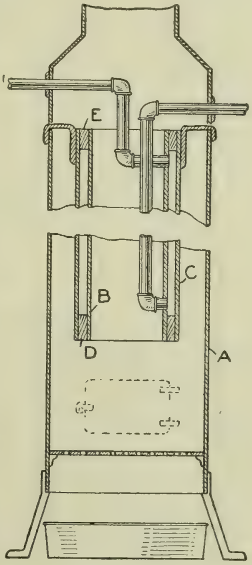
The illustration shows how a gun may be locked so it cannot be discharged, by using a padlock in the guard behind the trigger. It is well to have a safeguard of this kind on guns where the gun may possibly be handled by a careless person, or where there are children.—Contributed by Irl R. Hicks, Hallsville, Mo.



ℭPainters should not wash their hands in turpentine. It is better to use horse hair with a little kerosene to remove the paint, and then finish with soap and water.

Homemade Bath-Water Heater

It being necessary to have a bath-water heater, I constructed one of large pipe to work on the same principle as the instantaneous heater. The main body of the heater consists of a pipe, A, 8 in. in diameter and 40 in. long. This pipe was equipped with a door and grate at the lower end, and a tapering hood at the top for an ordinary stovepipe. Legs were also attached to the lower end to permit the use of an ash pan, and to procure draft.

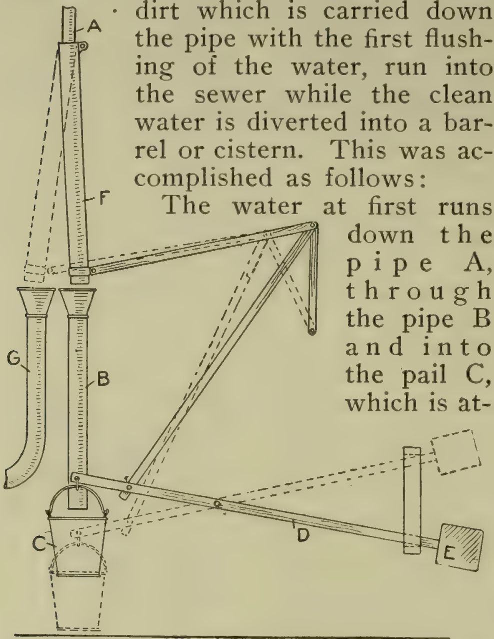


The water space is formed between the walls of two pipes, B and C, the inner pipe being 4 in. and the outer 5 in. in diameter, and each 20 in. long. The openings at the ends between the pipes were filled with rings, D and E, cut from a 4-in. coupling. The rings were driven between the pipes and then calked to make a watertight joint.

The inlet pipe entered the water space at the bottom and the outlet at the top. These pipes were ¼-in. in diameter. I have often heated water for a shower bath by burning a couple of newspapers in the firebox. Wood blocks or charcoal are ideal fuel for this heater.—Contributed by J. W. Shannon, Babcock, Ga.

A Rainwater Separator

A rainwater separator which is rather unique in operation is shown in the sketch. It was desired to have the dirt which is carried down the pipe with the first flushing of the water, run into the sewer while the clean water is diverted into a barrel or cistern. This was accomplished as follows:



The Weight of the Water in the Pail Automatically Turns the Water from the Sewer to the Barrel

The water at first runs down the pipe A, through the pipe B and into the pail C, which is attached to the balance arm D, as is also the counterweight E. As soon as the pail C is full of water, the short end of the balance arm is pulled down, thereby throwing the drainpipe F over to the pipe G, which carries the water into the barrel or cistern. A $\frac{1}{16}$-in. hole is punched or drilled in the bottom of the pail to allow the water to run slowly away until the pail is almost empty when the counterweight pulls it up and also pulls the pipe F back to the pipe B until the pail is full, and so on. —Contributed by Geo. M. Petersen, Buffalo, N. Y.

Destroying Flies with a Brazing Torch

A brazing torch in the hands of a careful person is the quickest means of getting rid of flies and other insects. Their wings singe almost instantly, if the blaze is turned to its highest heat. The blaze should not be directed against a wall or ceiling but in a line parallel to it and should be swept from side to side rapidly. It requires only a few minutes when the flies are settled to rid a large room of every one of them.

If the room is papered, the blaze should be as hot as possible and the strokes should be made only in one direction, as from right to left, removing the blaze to a safe distance from the wall at the end of the stroke.

As the blaze passes opposite them the flies attempt to fly and are carried into the blaze, their wings and often their legs are burned off and they fall to the floor where they can be swept up and destroyed. Neither paper nor the finest varnish need be injured in the least if proper care is used.

Every fly in the neighborhood of garbage cans and other infested places may be captured in this way, and I have got rid of mites in the poultry house by the use of the torch.—Contributed by W. A. Vinson, Vancouver, Washington.

A Lamp Tester

The sketch shows how I rigged up a tester for lamps for use on 110, 220 or 440-volt lines. I first cut a board as shown in Fig. 1, making it about 8 in. in diameter, with a handle long enough for a good grip, then four lamp sockets were located as shown. As the upper end of the sockets were tapped for a $\frac{3}{8}$-in. pipe, nipples were cut long enough to reach through the board, and used to hold the sockets.

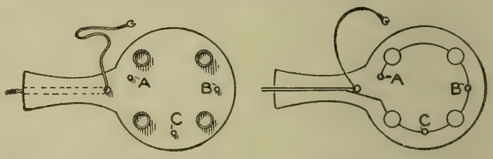


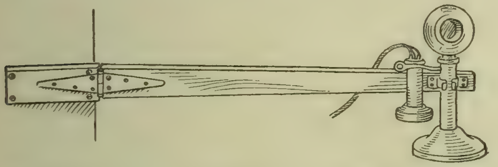
Fig 1 Fig. 2

The Tester can be Changed to Receive Current from Any Circuit and Any Voltage Lamp

Binding posts were located at A, B, and C. A hole was bored through the handle, large enough for the lamp cord, and connections made as shown in Fig. 2. The tester may be changed to receive current from any of the three different voltages by attaching the loose end to the different binding posts when using 110-volt lamps in the sockets. Attaching the end to A, makes a circuit for 440 volts; to B, for 220 volts, and to C, for 110 volts. New globes are used in the tester, and the lamp to be tested is placed in the last socket on its circuit.—Contributed by W. H. Stivason, Wilson, Pa.

Arm for Holding a Telephone

A very substantial and easily constructed telephone arm can be made of a piece of wood, a strap hinge and a metal lantern holder such as used on a carriage. The wood may be in any length to suit the requirements. It is hinged to a wall as shown in the illustration. The lantern holder is fastened to the outer end to receive the standard of the telephone. The outer end of the arm, at which the lantern holder is attached, also may be hinged to make a combination extension.—Contributed by O. B. Wright, Middletown, Conn.

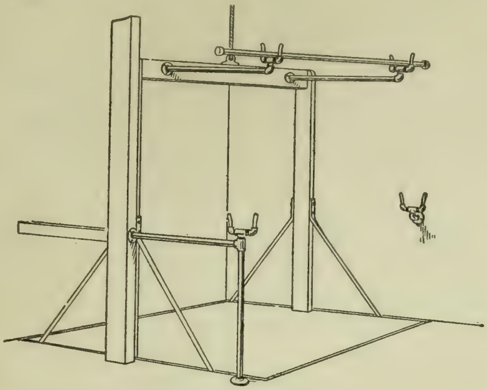


The Telephone can be Attached to or Detached from the Arm Quickly When It is Used on the Desk

An Elevator Guard Rail

The elevator in our building was placed in such a position that there was no room for swing gates. As this elevator was used between two floors only, a guard was made to protect the opening in the floor as follows:

The forks, supports and rail were made of pipe and fittings. The rail-carrying arms attached to the elevator beam were just long enough to pass through the hole in the floor. When the elevator descends, it leaves the guard rail on the floor and wall supports and at a height to keep anyone from falling into the opening. When the elevator is raised, the guard rail is taken up by the elevator arms. This device can only be used on elevators working between two floors.—Contributed by Hubert C. Kellogg, Rockford, Illinois.

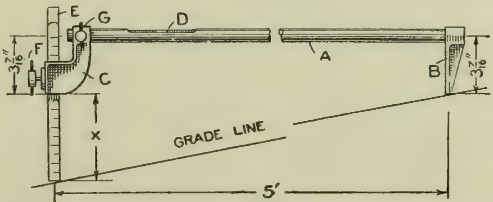


The Guard Rail is Automatically Taken Care of by the Operation of the Elevator

A Gradometer

A handy homemade device for measuring grades, which can be used for a number of different purposes, is shown in the accompanying sketch.

The instrument consists of a piece of copper tube, A, to which the two castings, B and C, are permanently fixed as shown. The copper tube is ⅞ in. outside diameter and $\frac{1}{32}$ in. wall. A small level, D, is fixed in the tube in the position shown. A scale, E, is made from ½-in. round cold-rolled steel and is made flat to receive the scale graduations. The scale fits the support C and may be adjusted by means of the screw F. For all ordinary grades the scale should be about



The Per Cent of a Grade can be Easily Determined by the Use of the Gradometer

24 in. long and graduated for 23 in. For grades over 38 per cent, a longer scale will be necessary. For convenience in carrying the instrument, a lug can be cast on the side of the scale support C, and the scale can be moved along on the tube and kept in place by the screw G.

In operation, the gradometer should be placed on the grade and the scale adjusted until the tube becomes horizontal as shown by the level D. Then read the distance X. To determine the per-cent grade, multiply the scale reading by 20, if in feet; if in inches, multiply by 1.666 (1⅔).

If it is desired to determine how steep a grade an automobile ascent is, without stopping the flow of gasoline in a gravity-feed carburetor, it is only necessary to jack up the front end of the car until the gasoline stops flowing and apply the gradometer to the running board of the machine. This is one of the many uses to which the gradometer can be applied.—Contributed by Edwin M. Wise, Elyria, O.

Septic Tank for Sewage from a Cottage

The question of sewage disposal in isolated cases where there is no opportunity for connection with a trunk sewer is a timely one to consider. An English writer in the Metal Worker describes and outlines the size of a septic tank and filter beds necessary to take care of the sewage from a cottage where the water supply is not overabundant. The writer states that, the water supply being limited, it would probably be sufficient to make provision for 10 gal. per head per day.

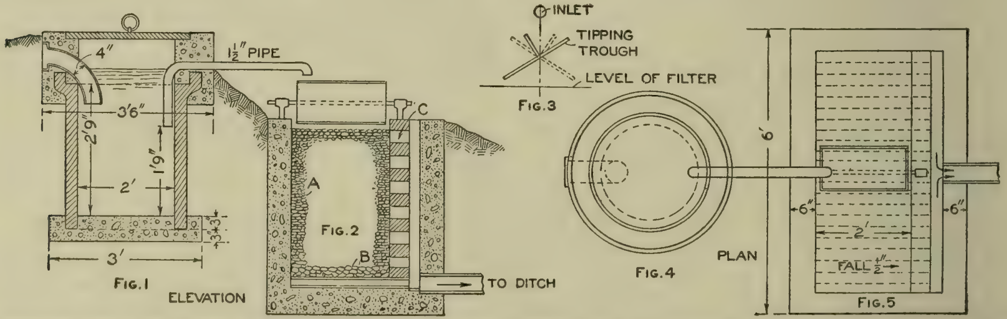
Assuming that the cottage will be occupied throughout the year by an average of four persons, the septic plant may be designed upon this basis, or in other words, four persons at 10 gal. per head per day making 40 gal., upon a dry-weather flow of this quantity of water per day.

An economical arrangement for this amount is indicated in the accompanying illustrations, where Fig. 1 is a vertical cross section through the tank; Fig. 2, a section through the filter, showing tipper above and outlet below; Fig. 3, a cross section of tipping trough; Fig. 4, the plan of the tank, and Fig. 5, a plan of the filter, showing tipper, with measurements.

The tank is formed by utilizing a 24-in. diameter stoneware pipe and making a concrete top and bottom for it. The whole is of such a nature that it could be constructed with such labor as would be available in any village or hamlet.

The work and materials for the tank would involve the excavation and removal of 1½ cu. yd. of earth, the making of ½ cu. yd. of cement concrete, a 4-in. stoneware inlet bed, a 1½-in. galvanized-iron outlet pipe, a 24-in. stoneware pipe, and a 2-in. stone cover, 2 ft. 6 in. in diameter, which is fitted with a lifting ring.

For the filter there would be necessary the excavation and removal of 3¼ cu. yd. of earth, the making of 1½ cu. yd. of cement concrete, and providing 16¼ sq. ft. of honeycombed wall,



Elevation and Plan Views of a Septic Tank Suitable for Sewage from a Cottage Where the Water Supply is Not Overabundant, or Where There is No Chance for a Connection to a Trunk Sewer

C; 53 lin. ft. of 2-in. drain tile; 1⅓ cu. yd. of filter medium; a tipping trough and a 4-in. stoneware outlet pipe.

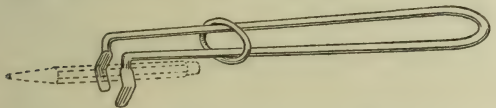
To construct the tank it is necessary to dig a hole 3 ft. in diameter, of the requisite depth, and then lay in the bottom 6 in. of cement concrete. The 24-in. pipe should then be pushed into the concrete and the surface of the latter tamped both inside and outside of the pipe, so that the concrete will be solid and will adhere to the unglazed portions of the pipe and give a watertight bottom.

When the concrete is set, the ground may be filled in around the pipe up to the level of the under side of the concrete curd. The concrete should be in the proportion of 1 of cement, 2 of sand and 4 of gravel or aggregate which is broken to pass a ¾-in. mesh.

The filtering medium should consist of the hardest and least friable material that can be obtained locally. The filtering material is broken to a ¾ or 1-in. gauge for filling at A, and all dust carefully screened out and then a depth of about 6 in. of material, 2 or 2½ gauge, is placed in the bottom at B, around and over the drain tile, leaving about 3 ft. for the finer material. The space of ½ in. should be left between the ends of each abutting drain tile, and the outlet ends are carried through the honeycombed wall into the effluent channel.

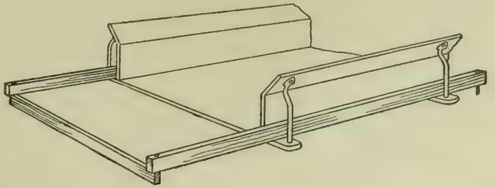
Holder for Small Tools while Tempering

The holder, or tongs, is made of a piece of ¼-in. steel rod, both ends being flattened and shaped as shown in the sketch. A small link is placed over the ends to hold them on the tool while heating and tempering.—Contributed by Chester L. Cobb, Portland, Maine.


The Grip of This Holder is Better for Small Tools than Ordinary Tongs

Extension for a Wagon Bed

An expressman had a medium-weight delivery wagon, and as he had to transport many articles too long to carry in the bed of the wagon, he made a frame of three pieces of 2 by 4-in. material which could be pulled out to the rear end of the bed, thus extending the support for the load several feet. When not in use, the extension is pushed up against the end of the bed. The sketch clearly shows how the sliding extension was made.—Contributed by C. R. Poole, Los Angeles, Cal.


The Extension is Permanently Attached to the Wagon Bed, Ready for Use when Wanted

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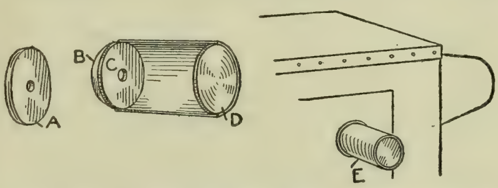
To Examine Carbons of a Moving-Picture Machine

A moving-picture operator rigged up an attachment through which he could examine the carbons that produce the light for projecting. The device consists of a small tube which has a stop, A, fitted in it at B, a lens, taken from an old police headlight, placed at C, and a ruby glass at D. The tube was inserted in the lamp house as shown at E. The carbons could thus be readily examined without injuring the eye.—Contributed by W. F. Polland, Corvallis, Oregon.



Tube with a Lens and Ruby Glass for Examining the Intense Light of the Carbons

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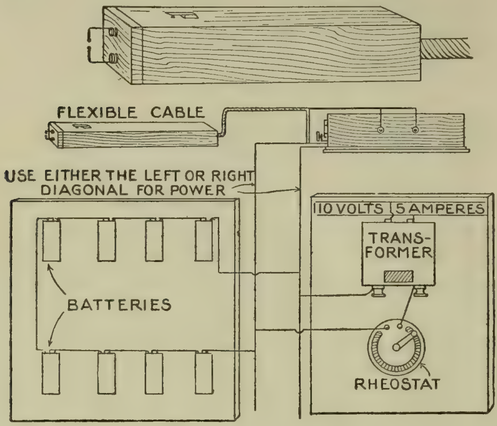
ℭA light pruning saw can be made of a keyhole saw blade attached to a long straight handle.

Lighting the Gas Stove

One can save many matches and much time by adopting one of the following plans for lighting the gas stove:

Stationary Lighting—In back of the gas stove may be placed a spark coil. At one side of the stove—usually the left—may be placed a push button, one wire of which is attached to one of the primary binding posts of the spark coil, the other wire to one side of the battery. From the battery run a wire to the other primary binding post on the spark coil.



The Igniter and Its Connections to Batteries or to the Lines of an Alternating Current

Using No. 14 R. C. twin wire connected to the secondary terminals and using tape to fasten the wire, run it along the gas pipe and terminate under each burner, using branches, the joints of which must be well insulated.

On the terminals of the branches may be placed small pieces of porcelain tube, letting the bare wire protrude about ½ in. from the tube and terminate about ⅛ in. from each other over one of the small holes in the burner.

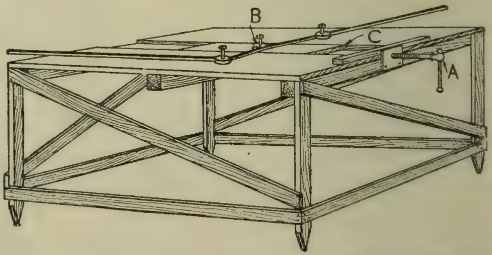
By turning on the gas of any burner and pushing the push button the gas will be ignited provided the vibrator on the spark coil is adjusted properly.

If the vibrator can be adjusted to take an alternating current in the place of batteries, a small cut-down transformer having a primary of 110 volts and a secondary of from 3 to 24 volts, may be used.

Portable Lighting—On a stove having many burners, or on which the wire would be in the way, the two wires to the push button may be run as directed, and the twin wire—four wires in all—into a block of wood, the secondary or twin wire terminating at two binding posts set in ⅛-in. asbestos and cemented to the end of the wood. Running between the binding posts and terminating about ⅛ in. from each other are two steel needles. The primary wires are attached to a spring on the side of the block, which, when pushed, makes the contact, and a spark flies between the needles. This may be used as a match.—Contributed by Theron P. Foote.

To Bend Reinforcing Bars

A homemade bench for bending reinforcing bars, devised by a correspondent of Engineering and Contracting, is shown in the accompanying sketch. The bench proper is 30 in. high and 5 ft. square. The bending device consists of two stationary sheaves and one movable sheave, B, mounted on a sliding strip, C, operated by a screw, A. The bar is inserted between the sheaves as shown and by operating the screw A, the sheave B is moved so as to produce the bend. A scale on the slide C indicates the travel required to produce the same bend on each bar. The sheaves can be taken from old blocks. The stationary sheaves are spaced from 10 to 18 in. apart, the heavier bars, ⅞ in. in size, requiring an 18-in. spacing.



Homemade Bench with Sheaves and Sliding Parts to Bend Reinforcing Bars by Screw Pressure

Alternating-Current Rectifier for Charging Storage Batteries

The ordinary storage battery used on an automobile for lights or ignition must be charged from time to time and, in most cases, the batteries must be taken to a charging plant for filling. Some users who have electricity in their home garage would like to recharge the cells and for this purpose the rectifier described is especially adapted.

A direct current is one that does not change in direction; it may however change in value. If a direct current does not change in value, it is called a steady direct current; if its value changes, but not according to any definite law, it is called a variable direct current; while if its value rises and falls at regular intervals, it is called a pulsating current. A steady direct current may be represented by the line A, Fig. 1, the vertical distance of the line A from the lower horizontal line at any given instant representing the numerical value of the current to any convenient scale. Likewise lines B and C represent variable and pulsating currents, respectively. An alternating current is one that reverses in direction at regular intervals and at the same time is changing in value. Such a current is represented by the line A in Fig. 2.

Where only an alternating current is available some means must be employed to change the alternating current to direct. There are a number of means that may be employed in accomplishing this. An alternating-current motor may be either belted or direct-connected to a direct-current generator. Direct current of any desired value up to the ultimate capacity of the generator or motor can then be drawn from the generator. Such a combination of generator and motor is called a motor generating set. In some cases the two machines are combined and constructed as a single machine, which is called a rotary converter. Machines of this kind are used to change alternating current to direct or vice versa; but it is beyond the scope of the amateur to construct such an elaborate outfit. The mercury-arc rectifier is another means of transforming alternating current to direct, but it is also too difficult for the amateur to construct. Some form of electrolytic rectifier may, however, be constructed by the amateur at a very small cost, and its operation will be quite satisfactory, although its efficiency is low as compared to the other types of rectifiers.

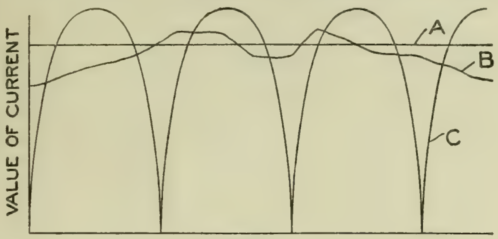


FIG. 1

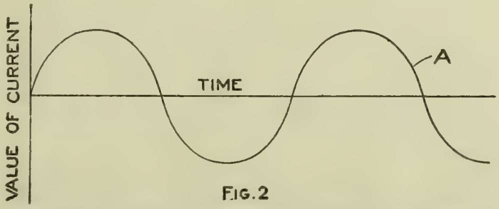


FIG. 2

The Lines in Fig. 1 Illustrate the Flow of a Steady, a Variable and a Pulsating Direct Current, and That in Fig. 2 an Alternating Current

The action of the electrolytic rectifier in an electrical circuit is very similar to the action of a check valve in a water pipe, and we shall speak therefore of the rectifier as a valve. It will offer practically no resistance to the current when it flows in one direction; but will offer a very high resistance to a current in the opposite direction. This being the case, an alternating current will pass through a circuit, into which an electrolytic rectifier is connected, only in one direction, and the current instead of being of the form shown in Fig. 2, will be similar to that shown in Fig. 3. This, however, would result in there being a current in the circuit for only one-half of the time, which would be a very undesirable condition; but fortunately it can be overcome by using four valves or rectifiers and connecting them as shown in Fig. 4.

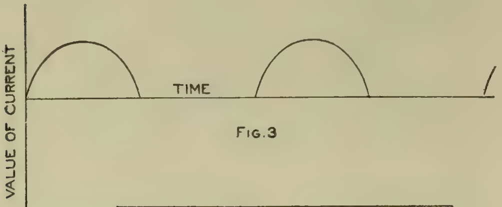


FIG. 3

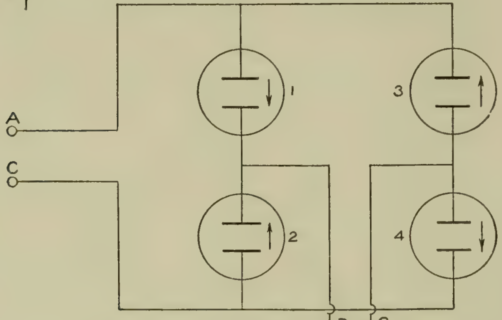


FIG. 4

Interrupted Flow of a Current through a Rectifier is Illustrated in Fig. 3, and Connections with Four Rectifiers to Make the Flow Continuous in Fig. 4

The small arrow inside of each circle indicates the direction in which the current will meet with least resistance in passing through that particular valve. If an alternating electrical pressure be applied to the terminals marked A and C, it will tend to produce a current through the circuit composed of the four valves. Let us suppose that the pressure is acting toward the right in the upper part of the wire AC. The greater portion of the current produced by this alternating pressure will pass through the lower resistance path, which in this case is through valve 1 to the terminals marked D and C, thence through valve 4 to the lower part of the wire AC. Next, suppose the alternating pressure is acting toward the right in the lower part of AC. Then the greater portion of the current will pass, through the valve 2, to the terminals D and C, thence, through valve 3, to the upper part of AC. It will be observed that the current passes through the circuit connected to the terminals marked D and C in the same direction in both cases, or its direction is independent of the direction of the alternating current. This current, although constant in direction, is not constant in value; it being nothing but an alternating current with one-half of the loops reversed in direction, giving a pulsating current similar to the one shown by line C in Fig. 1. This current may be used in charging storage batteries, and in practically every case where a perfectly steady current is not required.

Each of the valves, as they have been called thus far, consists of an aluminium plate and a conducting plate, such as carbon, lead, iron, etc., or any metal that is not acted upon by the solution into which they are immersed, which is called the electrolyte. This electrolyte is capable of acting on the aluminium plate in a very peculiar manner, when a current is passing through the rectifier. When the current is passing from the conducting plate to the aluminium plate it encounters very little opposition, the only resistance being that of the electrolyte. If, however, an attempt be made to send the current through the rectifier in such a direction that it must pass from the aluminium plate to the conducting plate, there will be a great opposition encountered and practically no current will flow. This action is supposed to be due to the formation of a very thin coating of oxide on the surface of the aluminium plate. Such a combination of plates and electrolyte is called an asymmetric cell.

An electrolytic rectifier that will deliver a current up to eight amperes at a pressure ranging from 10 to 90 volts, when operating on a 110-volt alternating-current circuit, may be constructed as follows: Obtain four battery jars, similar to those used for the ordinary "crowfoot" battery, which are to serve as containing vessels for the plates and solution. Make a wooden top for each of these jars, similar to that shown in cross section in Fig. 5, and boil the tops for a short time in paraffin. Cut out four wooden disks from some ½-in. wood, each disk having a diameter a little less than 3 in. Nail one of these disks in the center of the under side of each of the tops. Now obtain four pieces of ⅛-in. sheet aluminium, 6½ in. wide and 9 in. long. Drill a number of small holes near the edge of each of these pieces and rivet a piece of aluminium, ½ in. wide and 3 in. long, to the edge, as shown in Fig. 6. Bend each of these pieces in turn around some cylindrical object, about 3 in. in diameter, forming four cylinders. Nail these cylinders to the wooden disks fastened to the under side of the tops. The small ½-in. piece riveted to each cylinder should be bent out at right angles to the side of the cylinder before the cylinder is nailed to the wooden disk. Drill a small hole through the projecting piece of aluminium and top, and place a brass bolt in the hole, as shown in Fig. 5, which will serve as one terminal of the rectifier. Next obtain four 8-in. pieces of 1-in. lead pipe. Cut one end of each of these pieces as shown in Fig. 7, and bend half of the projecting portions thus formed in at right angles to the main part of the pipe so that they overlap, and drill a ⅛-in. hole through the bent parts. These pieces can now be fastened to the wooden tops for the containing vessels, by means of a small brass bolt, as shown in Fig. 5. The bolt holding the lead pipe is to form the second terminal of the rectifier. It no doubt would be well to drill a number of ½-in. holes in the aluminium cylinder in order that the electrolyte may have a better chance to circulate.

The efficiency of the electrolytic rectifier decreases very rapidly as the temperature of the electrolyte rises, and since there will be quite a temperature rise if the rectifier is used for any length of time, some means must be provided for keeping the electrolyte as cool as possible. This can be accomplished by passing cold water through several turns of glass tubing placed in each containing vessel. The glass tubes in the different jars may be connected together by pieces of rubber hose, and water supplied through a piece of hose connected to the faucet.

A small, open containing frame should now be made of such a form that all four glass jars may be placed in it and the connections between the various jars made more or less permanently. Two binding posts should be provided for the alternating-current supply leads, and also two for the direct-current leads.

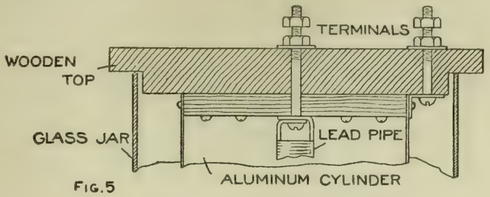


FIG.5

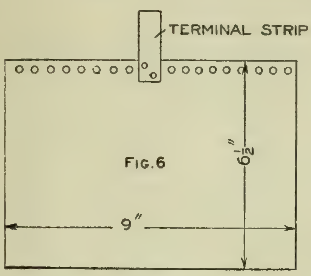


FIG.6

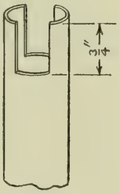


FIG.7

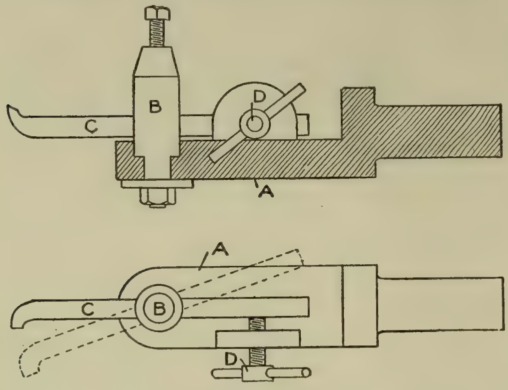
The Top of a Rectifier with Its Connections and Parts and the Method of Construction

The rectifier is now complete with the exception of the electrolyte which should be made as follows: Make a saturated solution of sodium phosphate by dissolving the phosphate in water until a small quantity remains in the bottom of the vessel. Add a little sulphuric acid to this solution and fill each of the containing jars, until the liquid is within one inch of the top when the elements are in place. The rectifier will operate better after it has been in use a number of hours, as the aluminium plates should be given time to become oxidized.

When this rectifier is connected to some source of alternating current and it is desired to vary the direct current supplied to some other circuit, a rheostat must be connected either in the circuit in which the direct current flows, or in the alternating-current circuit. The use of a rheostat will not be very efficient especially if the direct current is to be delivered at low voltage; and in such cases it is best to reduce the alternating-current pressure, by means of a small transformer.

A Recessing Tool for a Lathe

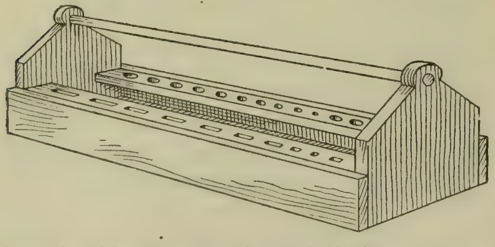
Having a large quantity of union nuts to make on an ordinary lathe, I designed a recessing tool to be used in the lathe tool post. This tool consists of a main shank, A, to fit the lathe tool post, and has an auxiliary tool post, B, which is drilled to receive the round-shank cutting tool C. A small projection is attached, or made as a part of the shank A, and is drilled and threaded to receive the feed screw D. The operation of the tool for recessing is obvious.—Contributed by M. Maplethorpe, Silverdale, England.



Screw-Feed Recessing Tool for Use in the Tool Post of an Ordinary Lathe

A Homemade Tool Box

The tool box has a holder on each side for small tools, one side for bits and small round tools, and the other for chisels and flat tools. The holders are made of strips of soft wood, fastened to the inside edge with screws and glue. The one for chisels has a small recess for each small tool, and the one for bits is laid out by marking the places for the holes, the larger ones at each end and tapering to the center. Then fit a piece about ½ in. thick, 1½ in. wide and as long as the box on the bottom beneath the strips to hold the tools.



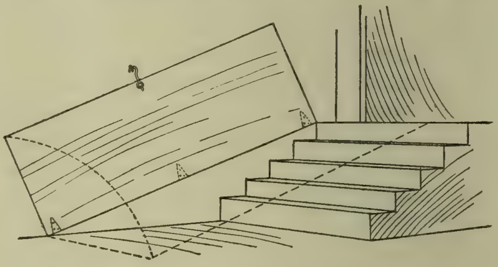
There is a Place Provided for Each Tool, and the Box can be Carried from Place to Place

Bore the holes for the bits, each with the tool it is to hold, through the strip and part way into the piece at the bottom.—Contributed by W. A. Lane, El Paso, Tex.

A Motorcycle Runway

A person living in an apartment and owning a motorcycle had to run it up a short flight of steps to get it into the house at night, says Motorcycling. This was no easy job, so he made a runway up which to run the machine.

A board, considerably longer than the flight of steps, so as to give a more gradual incline, was hinged to the wall at the side of the stairs so that it could be raised and allowed to rest flat against the wall or lowered so that it made an inclined path for the wheels. The board is lowered when the machine is run in or out, and when not in use is fastened to the wall.



The Steps are Turned into a Runway by Lowering the Hinged Board at the Side

Boiling Solutions in Glass

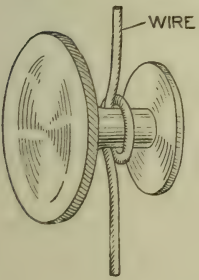
A great annoyance when boiling solutions in glass vessels in the laboratory or shop, is the "bumping" of the vessel as the liquid boils. This sometimes causes the glass to break. A way to remedy this is to fuse a short piece of platinum wire in the glass. This costs but little and because of its great conductivity of heat, it causes all boiling to come from the location of the wire—not from the glass.

The wire is laid on the glass inside of the receptacle, and this heated over a gas flame until it adheres to the wire. The wire may be placed in straight or coiled, as desired, or the surface of the glass will permit. The wire is not affected by any solution ordinarily employed, though a mixture of hydrochloric and nitric acids gradually corrodes it.—Contributed by Loren Ward, Des Moines, Ia.

Detecting a Missing Gasoline-Engine Cylinder

It is frequently difficult for the novice to detect a miss in a six-cylinder gasoline engine, also to distinguish between a miss and a weak explosion in either a four or six-cylinder engine. A missing cylinder may be easily and quickly determined by holding a piece of heavy paper about 1 in. from the exhaust end of the muffler. The explosions will force the end of the paper away from the muffler, but the moment a miss occurs, the end of the paper will be drawn against the muffler, being forced away again by the next explosion. The slapping of the paper against the muffler indicates a miss and not a weak explosion.—Contributed by Howard A. Thompson, Chicago, Ill.

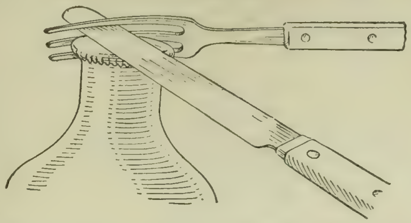
Holder for a Riveted Button



When a riveted button tears out of overalls or a jacket, a piece of wire attached as shown in the sketch will hold it securely. The button is placed in the hole torn in the garment and the wire is bent with pliers around the shank back of the cloth.—Contributed by E. A. Burton, Blessing, Texas.

Substitute Remover for Crown Tops on Bottles

When a crown-top remover is not at hand, an ordinary table knife and fork can be used as a substitute. Place one of the outside tines of a three-tine fork under the cap at the edge and slide the knife blade into the space between the other outside tine and the center one. A pressure on the knife handle will easily remove the top.—Contributed by Roy D. Erwin, Germantown, Pa.



A Knife and Fork are Articles Readily Obtainable, and can be Used to Remove Crown Tops on Bottles

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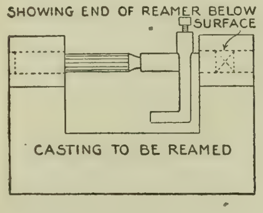
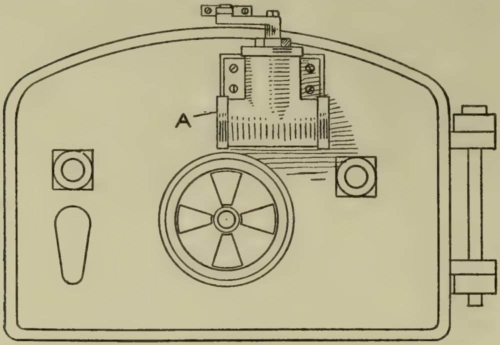
Reaming Holes in Odd-Shaped Castings



I have had occasion to ream castings like the one shown in the drawing—castings that had to have a hole reamed through the two hubs—and didn't have a reamer long enough to go clear through. A way to do this, if you have a reamer long enough to be in both hubs at one time so as to keep the holes in line, can be seen by a glance at the figure. After the reamer has been put down as far as a wrench will turn it, it is backed out enough to allow a lathe dog to be slipped over it and between the hubs. By means of this dog, the reamer may be turned, either with the hands or the assistance of a short bar, and passed down through the lower hub. Two holes reamed thus continuously are more apt to be exactly in line than if reamed separately from the outer ends.—Contributed by D. A. Hampson, Middletown, N. Y.

A Boiler Furnace-Door Check

It is well known that combustion of the volatile smoke-producing products evolved from each fresh charge of bituminous coal that goes into a boiler furnace demands the admission of air above the fuel bed, says a correspondent of the National Engineer. It is also a generally recognized fact that an excessive quantity of air thus admitted will impair the economy of combustion, although the objectionable smoke may be eliminated.



The Door Check Regulates the Inflow of Air Just after Throwing in Fresh Fuel

Intelligent handling of the fires and careful regulation of the furnace doors, to the end that just the requisite quantity of air gets through after each charge, and no more, will solve the problem of smoke suppression in a majority of cases and at the same time conserve the economy of the plant. However, when the adjustment of the air supply is left entirely to the direction of the fireman, as it necessarily must be in the absence of automatic regulation, the proposition will always partake largely of the element of uncertainty.

The illustration shows a device which meets the requirements perfectly. It consists simply of a door check, A, fastened to the furnace door with machine screws, after having been insulated for heat between the door and the check.

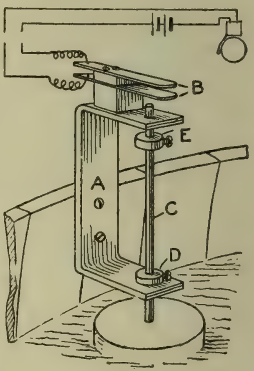
The check is equipped with a supplementary device for holding the door wide open while the fireman is putting in the fuel. When the catch is released, the door promptly swings to the closed position, but slows up long enough, when an opening of about 10 in. still remains, to permit the inrush of the required air.

A Lath Holder

For the workman lathing a ceiling the holder described in the following will prove useful and of help for fast work. Procure a barrel and stand two laths in it so that they will cross each other about 1½ ft. from the bottom, then nail the parts projecting out of the barrel firmly to the top edge. This will make a sort of back over which the laths cannot fall. Lay the lath to be used across the barrel. In this position they will be easily accessible and can be quickly raised to the ceiling without turning them over or around.—Contributed by C. S. Lathbury, Havana, Ill.

How to Make a Water-Level Alarm

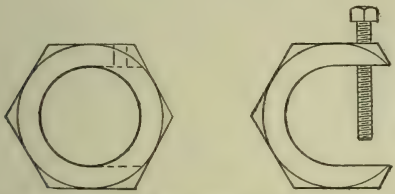
A simple water-level alarm and the method of constructing it are shown in the accompanying illustration. A piece of ⅛-in. brass, A, is bent as shown in the sketch, with two springs, B, mounted on top of it. These springs are insulated from the piece A and also from each other. A small brass rod, C, passes through two holes, one in each end, in the piece A. The lower end of the rod is connected to a float of sufficient buoyancy to raise the rod when the water comes up around the float. The movement of the rod is limited by two washers, D and E. When the rod is raised by the float to its upper position, the lower spring is raised and makes contact with the upper spring, closing a bell circuit, and



the bell rings, thus notifying the attendant that the water in the tank has reached a predetermined level. The bell can, of course, be located in the engine room or in any other convenient place, independently of the position of the tank. More than one bell may be connected to the circuit if the duties of the attendant should take him to various parts of the building.

A Small Clamp

A small clamp for light work can be made of a 2½-in. hexagon nut by cutting a portion out on one side, as shown by the dotted lines, and tapping one jaw for a setscrew. The clamp is then casehardened. It is especially adapted for use in hardening a template for marking holes.—Contributed by F. J. Hunt, Alameda, Cal.

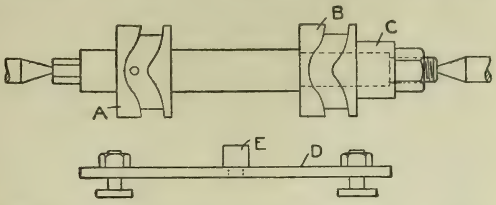


An Ordinary Standard Nut Shaped to Form a Clamp for Use in Doing Light Work

Turning Cams in a Lathe

The grooves in cams can be cut satisfactorily in an engine lathe by using the following method: A master cam, A, as shown, is first made and mounted on an arbor and held fast by a pin. This arbor can be any suitable length. The cam B, to be cut, is first finished on another machine, that is, the hole and turning and facing operations. It is to have a light-drive fit on the arbor and is held on by the collar C and a standard nut.

The collar is for the purpose of giving more working room between the cam to be cut and the lathe center. The throw of the cam is governed by bolting the strap D into the T-slots in the lathe carriage by means of the T-bolts. This strap will extend across the lathe carriage, and the roll E will fit into the groove in the master cam. By disengaging all of the feeds to the lathe carriage, it will travel back and forth for a distance equal to the throw of the master cam. By first using a tool in the lathe tool post narrower than the finishing grooving tool and running the lathe on the slowest speed, good results can be obtained.—Contributed by Harold E. Murphy, Westerly, R. I.

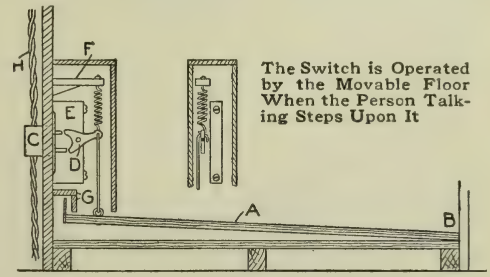


The Cams on a Mandrel in the Centers of a Lathe, and the Guide Strap

Operating a Fan and Lights in a Telephone Booth Automatically

Many telephone companies, in their desire to make the public as comfortable as possible while using their phones by installing electric fans in the booths, find that the cost of the energy to operate a large number of these fans continuously for a month is quite an item.

A number of different methods may be used, however, to automatically disconnect the fan when the booth is not occupied. The accompanying illustration shows one method of opening and closing the circuit automatically by means of a false floor, A, placed in the booth, it being hinged at the front end B and normally raised at the back end by a coiled spring.



The Switch is Operated by the Movable Floor When the Person Talking Steps Upon It

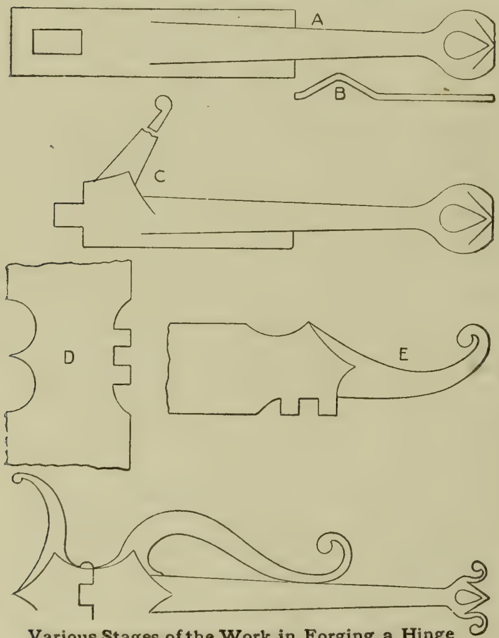
When a person enters the booth the floor is depressed and the switch thrown to the "on" position. The floor is raised by the spring when the booth is vacated, and the switch thrown to the "off" position.

The switch C is of the push type mounted in the back of the booth. A piece of brass or iron of the form shown at D is mounted on a piece of hard wood, E, which in turn is fastened rigidly to the back of the booth. An eye bolt is fastened in the false floor directly under the outer end of the piece D and connected to it by means of a small rod. Make sure this rod is long enough to allow the false floor to drop down and rest on the main floor of the booth. A small bracket F is then mounted on the back of the booth directly over the end of D and a coil spring fastened between F and D, as shown. The whole device may then be inclosed by a small wooden box as shown. The pieces G serve to prevent dirt from getting down behind the false floor.

Ordinary switches may be placed in the lamp and motor circuits H, respectively, after they leave this special switch, so that either or both of them may be turned off permanently.

How to Forge Hinges

A little extra time spent on the making of a hinge will produce artistic results, pleasing to the eye and creditable to the worker. A correspondent of the American Blacksmith describes how to forge a hinge of attractive design as follows:



Various Stages of the Work in Forging a Hinge of an Attractive Design

Take a piece of iron wide enough to allow splitting out the two pieces on the sides and leaving a fairly proportional piece in the middle. To make the hinge part, draw down the end and make two cuts with a thin, hot chisel, very nearly through, just enough to be able to see the cut from the opposite side. The length of the cuts should be the thickness of the iron added to the diameter of the pin multiplied by 3.15. Then bend with the cut part on the inside. The reason for this cut is that the welding may be done better. There is no fear of burning the inside edges of the hinge in welding, and the hole can be drifted out better for the pin of the hinge. It also makes it easy to cut out the piece afterward, without spoiling the hole. The end of the lap should always come on the back of the hinge to be welded, so that if any marks are left in welding they will not show.

The hinge part being completed, the scrolls should be drawn out and shaped to suit. But before they are drawn down to the right size, a piece of round iron should be taken and bent, as shown at B. This is to be driven in the hinge when hot, to make the diamond-shaped corners, and the iron should be drawn down smaller from the imprint, which will leave the block partly raised. In forging, a piece should be left, large enough for a hole to be punched through it, as shown in the end of C. The other side is then treated in the same manner. In forging out the scrolls, they should be made graceful and free from kinks.

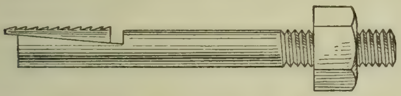
To make the other half, take a piece of iron and fuller in, then draw out as at D. If a power hammer is at hand, it is best to make them out of one piece; but if not, the hinge part should be welded on the side of the flat piece, the ends then drawn out, leaving a round disk on each end, and bent.

Locating Leaks in Gasoline-Engine Intake Connections

To locate a leak in the intake pipe or carburetor connections of a gasoline engine, fill a common oilcan with gasoline and, with the engine throttled down, squirt the gasoline on and around the different joints. When the faulty joint is reached the engine will speed up quite perceptibly, the acceleration depending on the size of the leak.—Contributed by C. F. Fuller, Pontiac, Mich.

An Expansion Bolt

Procure an ordinary bolt of the proper length and size and saw a wedge-shaped notch, about 1¼-in. long, in the end, as shown in the sketch. The piece sawn from the bolt is serrated on its outside surface and placed in the notch. The piece and bolt are inserted in the hole and when the nut is turned up, the piece will wedge the end and hold it solidly in place.—Contributed by G. H. Holter, Jasper, Minn.

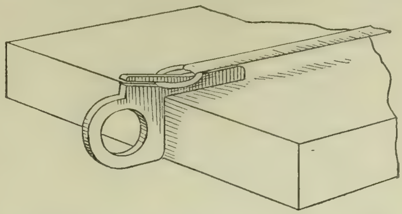

As the Nut is Turned Up the Wedge-Shaped Piece Tightens the Bolt in the Hole

To Fasten a Hammer on a Handle

The annoyance of having the hammer come loose from the handle may be overcome by using a common horseshoe nail as a wedge. The nail is cut off to make the length a little less than the eye in the hammer. The head of the nail is wedge-shaped and has one corrugated side which makes it ideal for the purpose.—Contributed by Frank Boehm, Maspeth, L. I.

A Tapeline Holder

It is very difficult to measure with a tapeline alone, so I made a holder as shown in the sketch which is placed on the end of a rail or whatever material being measured. This device also makes it easy for a helper to hold a line.—Contributed by Le Roy Bradley, Lorain, Ohio.

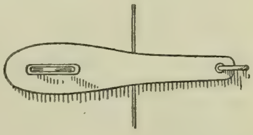

The End of the Tapeline Measure is Held Flush with the Material Being Measured

Sizing a Threaded Hole

It sometimes becomes necessary to transfer the size of a threaded hole from some out-of-the-way place to the shop in order to make a piece to fit it. With proper tools this is easy; without them, it might be difficult. One thing is always at hand and that is wood. Whittle a stick tapering until it starts in the hole. Then turn it into the hole and a fair thread will be made on the wood. The stick can be carried in the pocket without risk of changing the size, as would be the case with ordinary calipers.

Lock for the Inside of a Shop Door

Usually all shop doors have locks on the inside except the one through which the workmen enter. A simple lock for this door can be made of a piece of strap iron having a hole in one end for a staple, and a slot in the other large enough to pass over a screweye. A quarter turn of the screweye locks the door. The screweye should be turned up so that it will bind against each side of the slot.



Reviving a Dead Dynamo

It sometimes happens in power stations when starting up a dynamo that it will not build up its voltage. Shifting the brushes back and forth does not even bring a spark out of it. It is practically dead, at least as to exciting its own fields. But it must be started, if possible, and often in a hurry. But how?

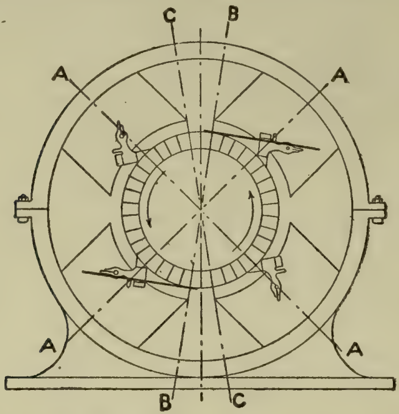


Diagram Showing Lines of Force and How the Copper Strips are Held on Two of the Brush Holders

Reviving a dynamo in this state is described by a correspondent of the Practical Engineer. The dotted lines, AA, AA, indicate the neutral points of polarity at which the brushes are usually set for the normal loads, although they often are advanced slightly for overloads.

The extreme edges of the field cores are indicated at BB, beyond which is the extreme of the polarity. With the brushes set at this point, if the brush-holder yoke allows such a variation, the machine would develop its highest voltage.

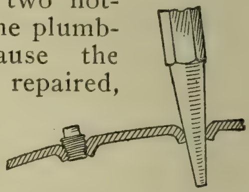
The line CC indicates the back edge of the field core, or the beginning of the magnetic impulse as the armature coils pass under this edge. To rock the brush-holder yoke back far enough to bring the brushes under this edge of the field core would diminish the voltage, in fact, bring it down very low.

Such troubles do not puzzle the man who has made a study of magnetic fluctuations and understands them, but many a man has never had the chance to learn this part of the dynamo's operation, and to him a dynamo that refuses to operate is a serious problem. In this case the brushes were rocked over to the limit of the slot in the holder yoke, bringing the brushes just 1 in. back of the line BB. Still, the machine showed no sign of generating, only a volt or two being indicated on the voltmeter.

Before connecting a wire from another machine to charge the field coils, it was decided to hunt for the extreme polarity, by taking two long strips of thin, flat copper, ¼ in. wide, and letting a man hold each strip across the brush-holder stud, allowing the point to come on the commutator just past the line BB, as shown in the sketch. Instantly there was a sparking and spitting from the ends of the strips. The machine started to build up and increase its voltage very rapidly.

The brush-holder yoke was immediately moved back to about 2 in. from the line CC. The voltage dropped as rapidly as it had risen. Shifting the brushes back to the dotted lines AA, AA, the voltage became normal and was then regulated by the rheostat, and the machine put in service.

Repairing Leaks in Range Boilers



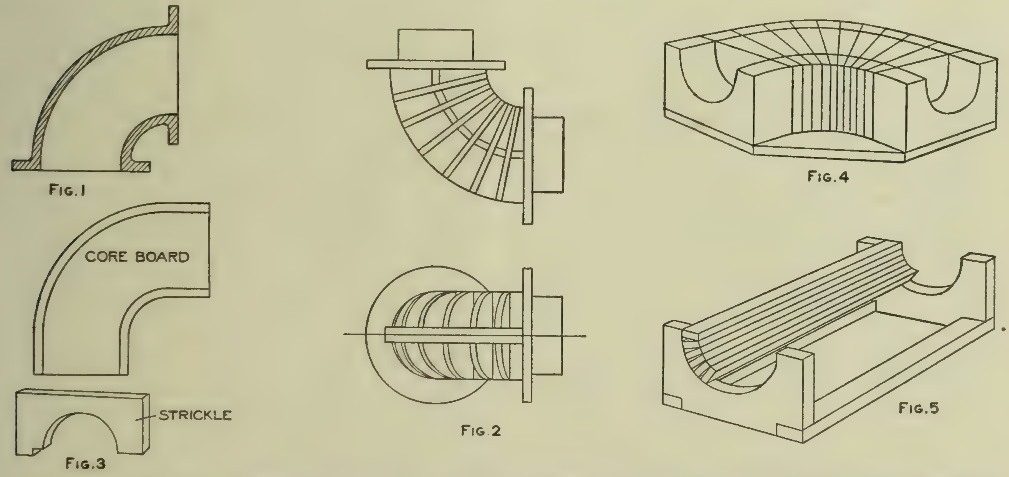
After replacing two hot-water boilers on the plumber's advice, because the leaks could not be repaired, we decided to find some means of stopping a pinhole leak in the third boiler. We made a successful repair by driving a taper punch into the hole just far enough to admit the point end of a ⅛-in. pipe tap. After tapping the hole a ⅛-in. plug was turned in tightly, after thoroughly covering the threads with white lead.
—Contributed by H. J. Holden, Ontario, Cal.

ℭLacquer should not be stored in galvanized-iron tanks.

Short Cuts in the Pattern Shop

When time permits or a sufficient number of castings are required to justify the outlay, it is no doubt better to provide the molder with a first-class pattern, but it sometimes happens that a casting is wanted in a hurry, or but one casting is ordered for some odd job. It is in cases like these that the patternmaker's wits are taxed to bring about the desired results with the smallest possible expenditure of time and money.

For instance, a special elbow is required as shown in Fig. 1, and the order comes to the shop at noon and a pattern must be made and in the foundry before the close of the working hours, ready for the molder early the next morning. The pattern-shop operation in this case is as follows: Two pieces of 1-in. board are doweled together and cut to the outline of the elbow without the flanges, and the flanges, coreprints and half-round pieces are added to make the skeleton pattern as shown in Fig. 2. Between each half-round piece another piece is nailed to add stiffness to the whole pattern, and a strickle is provided to smooth off the loam filling that the molder uses to convert the skeleton into a full pattern.



Cross Section of a Special Elbow and the Construction of a Temporary Pattern and Core Box from Which to Form a Mold to Make a Casting in the Shortest Possible Time

The core is made on a board, Fig. 3, and swept up with a strickle. This board is about 1¼ in. thick with battens screwed to the under side to hold it straight, and is cut to form the outline of the pattern and long enough on the ends for the prints and half-round pieces that mark the ends of the core. The strickle is made to the diameter of the core and has a bearing on each edge of the board, equal to the thickness of the metal, and is provided with a lip that projects over the outer edge of the board to maintain the proper thickness while the core is swept up. About the only tools needed for this job is a band or jig saw and a spoke shave. Sandpaper or varnish are not used.

This skeleton-pattern and core-board idea is applicable to pipes of various shapes, with and without branches. On straight pipes the skeleton is sometimes covered with thick cardboard, fastened with large-head tacks. This makes a very satisfactory pattern and dispenses with the loam filling, but the molder must be careful in ramming to avoid puncturing the cardboard sheathing.

Small elbow or bend core boxes can be turned out very quickly by building up the curved part of wedge-shaped pieces with the joints running to a common center as shown in Fig. 4. The bend is laid out on the face of the built-up portion and each wedge-shaped piece sawn separately. This leaves but a small amount of stock to remove after the box is reassembled. It is well to build this box on a bottom board as illustrated.

A quick way of making straight half-round boxes is to saw the ends or foundation pieces 3 in. or more larger than the required diameter of the box and then fill in with strips, ⅞ or 1 in. thick and wide enough to bring the box to the correct diameter, as shown in Fig. 5. No attention is paid to the joints between the strips, only to use thick glue in the joints when nailing them to the foundation pieces. If the strips are made parallel and of proper width the amount of stock to be removed with the round sole plane is very small.

Another short-cut method of providing the means for producing half-round and other cores is through the medium of frame core boxes. Frame boxes should be so constructed that they lift away from the finished core and should be of heavy enough stock to resist ramming without springing out of shape. Broadly speaking, there are but two kinds of frame boxes. In one, the core is formed by a strickle riding on the ends, the shape of the ends determining the shape of the cross section of the core, while the lengthwise shape is formed by the strickle. In the other, the cross section is formed by the strickle which is worked back and forth lengthways of the box. This form of box is only used for cores having the same cross section from end to end. From these two boxes many combinations may be made, producing thereby an endless variety of cores. The construction of some of these boxes is fully shown in Figs. 6, 7, 8 and 9.

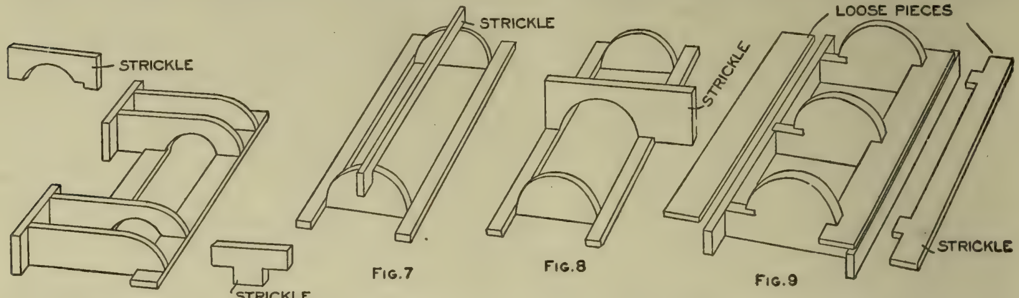


Fig.6 Fig.7 Fig.8 Fig.9

Four Methods of Constructing Frame Core Boxes in Which Strickles are Used to Form the Cores after Which They are Placed on Cast-Iron Plates for Baking

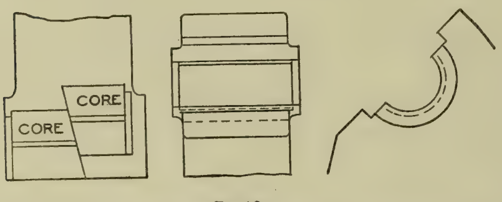


Fig.10

The Core as It is Placed in a Mold to Form a Babbitt Recess in a Pillow Block

Frame boxes are more durable than core boards, because the boards must be put into the core oven until the cores are dry enough to be handled with safety, and this shortens the life of the board very much, as it is apt to char the edges. Where a larger number of cores are required, a cast-iron plate, ½-in. thick and similar to the core board, can be made. It is used in the same manner as the core board, but being of iron, it is not affected by the heat of the core oven. In making patterns for core plates, a double allowance for shrinkage is necessary, as it is important that plates and boards be accurate in order to secure an even thickness in metal in the finished casting.

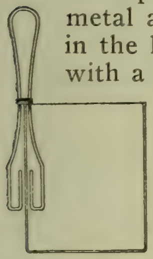
Another demonstration of the frame core-box idea is shown in the box for coring the babbitt space in a pillow block. This block was an integral part of an engine bed that was molded and cast with the pillow block down. On account of the facing pieces projecting beyond the sides of the block, the problem of setting the core presented some difficulty, but this was overcome by inserting an angled loose piece in the center of the box. This cut the core into two pieces and permitted it to be set without the slightest trouble. Figure 10 shows clearly how this was accomplished.

A Substitute for a Planimeter

Some time ago I had an irregular-shaped surface of which I had to find the area. I had no planimeter, so I took a piece of tracing cloth large enough to cover my drawing and drew small squares on it representing square inches at the scale the drawing was made. I then laid the tracing cloth over the drawing and drew the outline of the surface on the tracing cloth. Counting the number of squares inclosed in the outline gave me the area of the irregular surface.—Contributed by Theo. A. Oberhellmann, St. Louis, Mo.

A Paint-Stirring Paddle

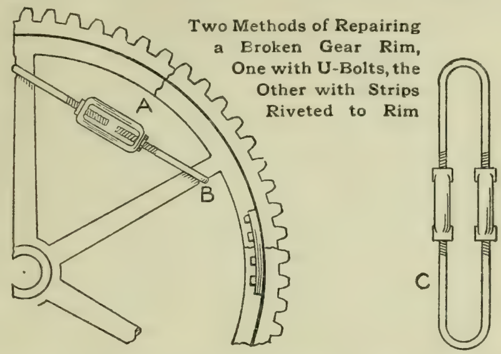
A stirring paddle made of a rod is far superior to one cut from sheet metal and perforated. The holes in the latter will become covered with a film of paint which closes the openings. The rod paddle is formed as shown in the sketch, and the extending ends easily slip over the side of the paint pail where the rod is not in the way of the paint brush.



Repairing a Broken Gear Rim

At one time I assisted in repairing a large pump gear wheel which had a crack in the rim, says a correspondent of Power. The location of the crack was at the point A. The spokes were notched out, at B, so as to afford a good bearing for the U-bolts shown at C, which were fitted on and turned up tightly with a pair of turnbuckles.

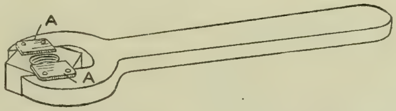
Another repair which was used on smaller gears was accomplished by bending two heavy strips of iron to conform to the inner surface of the wheel rim, and two holes were drilled in each end of the strip so that they would be a safe distance away from the crack. These were laid in the rim of the wheel, one on either side of the boss, if there happened to be any, and fastened firmly with capscrews, set up tightly.



Two Methods of Repairing a Broken Gear Rim, One with U-Bolts, the Other with Strips Riveted to Rim

Nut-Holding Clips for a Drop-Forged Wrench

A heavy wrench that required a pull with both hands frequently slipped off the nut or cap whenever I eased up on the pull in using the wrench horizontally. To remedy this I fastened two metal plates, A A, on the jaws. This kept the wrench in position as the plates rested on top of the nut or cap.

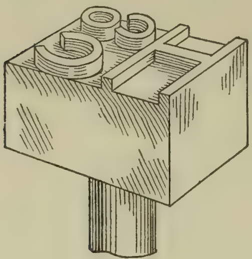


Each Plate is Fastened to the Jaw so That the Projecting Part Extends over the Nut

The plates can be fastened either with screws or rivets.—Contributed by James M. Kane, Doylestown, Pa.

ℭIn case of emergency, a canvas car cover can be used to take the place of an inner tube. The cover must be well packed in the casing.

How to Make a Brand



Several contractors working on the same job had planks, scaffolding, etc., scattered about and stored in the vicinity of the work. Such lumber does not take painting or stenciling very well and as a consequence the ownership of much of the property was often in doubt. One contractor conceived the idea of branding and consulted a machinist to see what could be done. A piece of steel, 1 by 2 by 2 in., was cut off, faced on one side and the initials of the company laid off in reverse on the face. Holes were drilled to form the centers of the letters C and O. A dozen or so cuts of a hacksaw reduced the metal in the H and between the letters to as many thin ridges which were chipped out with a chisel. By chipping and filing the brand was completed. The back was drilled and tapped to receive a ½-in. pipe, 2 ft. long. This served as a handle. The tool was heated in a riveter's forge and each piece of material branded.—Contributed by Donald A. Hampson, Middletown, N. Y.

A Chain an Accessory to an Automobile Tool Box

A piece of chain about 3 ft. long, is apt to come in handy very often and should be carried along with the tools in any automobile. When stuck in the mud, when the wheels slip, or on a smooth, inclined surface which affords no hold for the tires, all that is necessary is to wind the chain around the tire on one rear wheel and apply the power. This method will make it surprisingly easy to get over a sandy spot in the road, and will often prevent the embarrassing necessity of being towed out.—Contributed by E. K. Marshall, Oak Park, Ill.

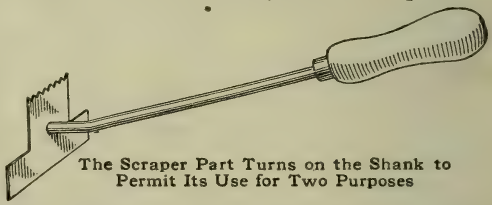
To Make a Wood Letter for Printing

When, in printing from wood type, it is found that the font is short some letter or numeral, turn one of the blocks upside down and draw on it the letter or figure required, in a reversed position. This can be easily accomplished by taking an impression of the needed letter on paper, cutting it out and laying it reversed on the block. Then trace around the outline and cut the wood away from the letter. After using this letter, the block can be reversed and the original type face printed from without harm to the other.—Contributed by A. A. Kelley, Malvern, Pa.

A T-Slot Cleaner

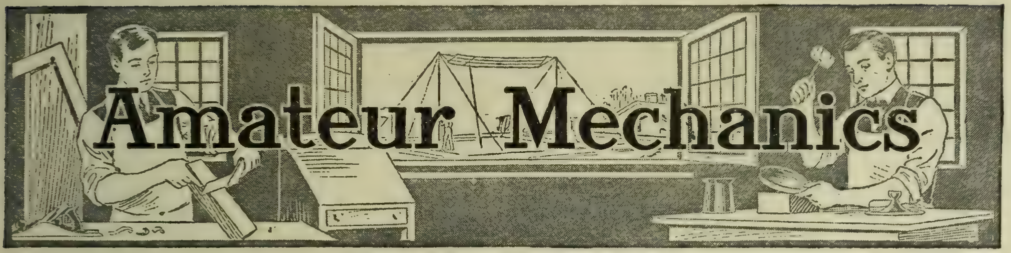
Every machinist must use a cleaner to remove the chips and oil from the T-slots of lathe carriages, boring mills and planer tables. The cleaner is ordinarily made of sheet stock, with one end cut T-shape and the other left long enough to be used as a handle. The method of using it is to draw the cleaner through the groove, to remove the chips, says Southern Machinery, after which a piece of waste is forced through with a file or screwdriver leaving the slot well cleaned.

A slight improvement has been made in this type of cleaner, as shown in the sketch. A piece of sheet stock is cut T-shaped and riveted loosely to the shank on the handle, so as to permit the cleaner to turn on the shank. After the T-end has been used to force out the chips, the cleaner is turned over and the toothed end used in forcing the waste through the slot.



The Scraper Part Turns on the Shank to Permit Its Use for Two Purposes

ℭA squeaky cylinder denotes loose piston rings, which, if not remedied, will result in scored cylinder walls.



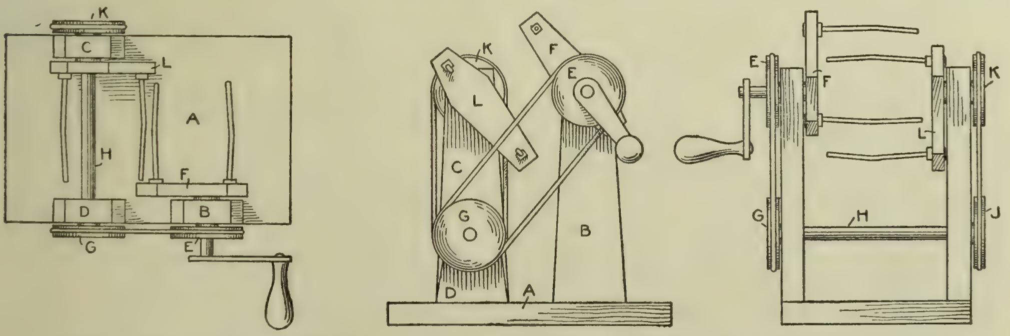
How to Make a Candy-Pulling Machine

Almost every person knows how to make old-fashioned pulled candy, and the machine illustrated adds greatly to the cleanliness of the product and consequently to its enjoyment. Most of the parts are constructed of hard wood and should be made strongly to stand the strain.

The base A of the machine is an oak board, 12 in. long, 8 in. wide and 1 in. thick. There are three standards for carrying the rotating parts. Two of these standards, B and C, are 10 in. long, 3 in. wide at the base, 2 in. wide at the top, and 1 in. thick. These two standards are secured to the opposite sides of the base, 2 in. from each end as shown in the sketches. A third and shorter standard, D, is 4 in. long, 3 in. wide at the base, 2 in. wide at the top, and 1 in. thick. This standard is secured to the same side of the base as B, and directly in line with the standard C. A ½-in. hole is drilled through each standard 1 in. from the top.

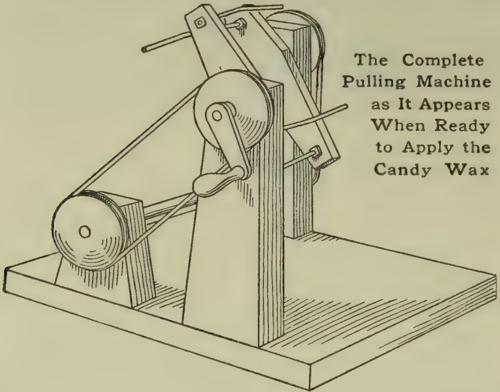
Four grooved pulleys or wheels, 3 in. in diameter and ½ in. thick, are required, and these can be cut out with a hand jig saw and the grooves cut with a half-round chisel, or they can be purchased at a woodworking shop. These wheels are to have $\frac{7}{16}$-in. holes bored in them for the spindles. On one end of a spindle, formed of a ½-in. iron rod, 2 in. long, one wheel, E, is driven and secured. The fastening may be done by keying, by fastening nuts on both sides of the wheel, or by drilling a hole through the wheel from its periphery to correspond with a like hole in the spindle. Whatever plan is chosen the wheel must not slip on the spindle.

To the opposite end of the spindle the arm or stretcher F is attached. This arm may be made either of a good piece of oak or of iron—the latter being the best material. The arm is 6 in. long, ½ in. thick and 2 in. wide at a point one-third its length from one end, with the ends 1 in. wide. If iron is used, these dimensions, except the length, may be considerably reduced. A hole, $\frac{7}{16}$ in. in diameter, is bored through the center of the widest part



The Plan, End and Side Elevation of the Pulling Machine with Each Part Bearing the Same Reference Letter in All Sketches to accommodate the end of the spindle. A crank with a handle is attached to the wheel E and used to rotate the device.

The arm or stretcher carries two strong bent fingers, made of ½-in. iron rod, 4 in. long. To hold these rigidly in place to the ends of the arm, the rod should be threaded at one end, a nut turned on the threads and a washer placed against the nut. The threaded end is then slipped through the arm and another nut turned on tightly.



The Complete Pulling Machine as It Appears When Ready to Apply the Candy Wax

The wheel G is attached to a shaft, H, as well as the wheel J, the shaft turning in the standards C and D. Another arm, L, is connected to the wheel K with a short shaft, which are duplicates of the parts E and F. The wheel G is driven by a belt from the wheel E, and the wheel K is rotated by the wheel J. The result of this combination is that the arms F and L revolve in the same direction. The belts, which are round, should be put on so that the arms are located as shown for starting the machine.

The candy wax when ready for pulling is placed across the fingers and the crank turned. The candy pull is broken at every half revolution and doubled back on itself on the next half turn.—Contributed by A. Frederick Collins, Congers, N. Y.

Substitute Sink or Bathtub Stopper

Milk-bottle caps make good substitutes for the regular rubber stoppers in sinks and bathtubs. The water soon destroys them, but as a new one usually is had each day, they can be used until a regular stopper is obtained.

A good permanent stopper can be made by cutting a hollow rubber return ball in half, using one part with the concave side up. It will fit the hole of any sink or bathtub. One ball thus makes two stoppers at a cost of about 5 cents.

A Gas Fire Kindler

A useful and simple kindler can be made of material easily obtained in any plumbing shop. The parts required are as follows: One 10-in. length of ½-in. pipe; two 9½-in. lengths of ½-in. pipe; two ½-in. return bends; one ½-in. cap; one ½-in. tee; one ½-in. plug and one mixer.

The pipe, return bends, tee, plug, and cap are connected as shown in Fig. 1. The mixer A is attached into the tee as shown, if the range has a door in the side of the fire box, but if the door is in the end, it is turned into the end of the tee and the plug is screwed into the opening not used by the mixer.

Measure the distance between the centers of the openings in the grate B, Fig. 2, and bore $\frac{1}{16}$-in. holes into the pipes to coincide with the grate openings. The kindler is placed under the grate so that the holes are between

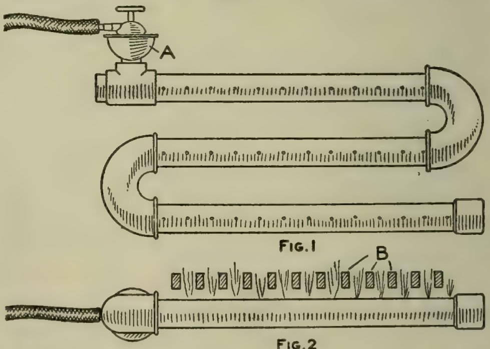


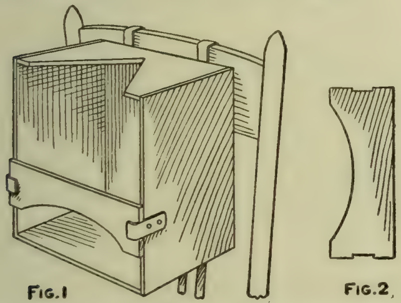
Fig. 1

Fig. 2

A Fire Kindler That may be Used in Chilly Weather as a Grate without Coal or Wood the grate bars. A simple stand or fixture adapted to the range should be used to hold the kindler in place. Connect the nozzle of the mixer with a convenient gas jet by means of a gas hose. The fire box should be filled about half full of coal and the kindler lighted. The long hot flames ignite the coal in a short time and the kindler is then removed.—Contributed by O. E. Tronnes, Wilmette, Ill.

Homemade High Chair for Babies

A quickly and cheaply made adjustable high chair for the little one is shown in Fig. 1. It is made from a strong box, that may be procured from a grocer, and four iron straps, about 1 in. in width. A V-shaped notch is cut in the box top and a notched front board is shaped as shown in Fig. 2. The notches in the ends are to fit securely between the metal clips.

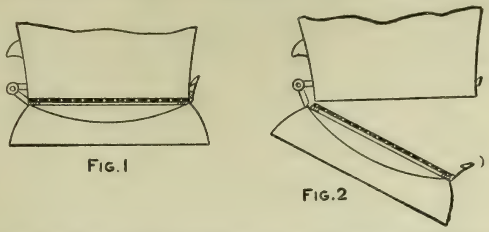


The Box can be Easily Affixed to an Ordinary Straight-Back Chair to Make It into a High Chair

Two metal hooks are attached on the back so that they will hook over a straight-back chair. A chair of this kind takes the place of a high chair at the table.—Contributed by W. A. Jaquythe, Richmond, Cal.

A Dust-Catching Coal-Hod Bottom

Those using coal hods know how the coal dust will settle at the bottom of the pail and form in a solid mass if allowed to become damp. The illustration shows a coal hod having a bottom which overcomes this difficulty. A perforated disk, shown in Fig. 1, rests on a collar at the bottom of the hod. The whole weight of the coal rests on the disk. The curved line shows in section a half-round bottom, which receives the coal dust as it is sifted through the disk. The bottom is hinged, Fig. 2, to the hod and the dust may be easily removed by loosening the clasp.—Contributed by A. W. Taylor, S. Norwalk, Conn.



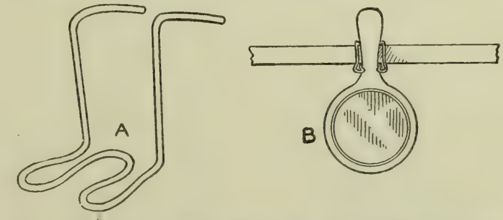
The Bottom of the Hod Has a Dust Receptacle Which is Easily Cleaned When Opened

To Clean Silver

A good method to clean silver of any kind is to place the articles in an aluminum vessel and add a few pieces of zinc. Hot water is added and the silver boiled until clean. It is best to use soft water. The tarnish is removed by the electrolytic action of the zinc on the aluminum and the silver, and the latter will take on a bright luster. This method of cleaning will not injure oxidized or black silver, nor that which is partially oxidized.—Contributed by Loren Ward, Des Moines, Iowa.

Holder for a Hand Mirror

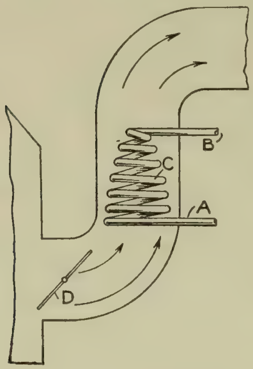
An ordinary hand mirror may be converted into a convenient shaving mirror by using a little device made of heavy wire as shown in the sketch A. With it the mirror B may be hung in a window so as to afford an excellent light for shaving.—Contributed by E. K. Marshall, Oak Park, Ill.



The Bent Wire Easily Holds the Hand Mirror on the Window Sash for a Shaving Mirror

Water-Heating Coil in a Furnace Pipe

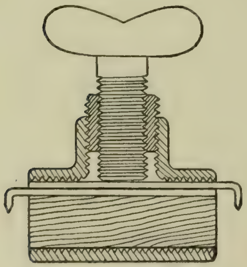
The accompanying sketch shows a plan I adopted for conserving the waste heat from my furnace. I found that I was able to put a coil into the smoke pipe, which was about 8 in. in diameter, and thus heat water for domestic purposes. It will be seen that the coil is spiral in shape rather than cylindrical, as the latter would leave a free passage up the center and therefore would not bring enough gases into contact with the coil.



In addition to this coil I have a gas heater near the tank which is used only in case the demand for hot water exceeds the capacity of the coil, which is naturally not as efficient per unit of length as one directly within the firepot would be. It has the advantage of not absorbing heat which should go to make steam, but only that which would otherwise be wasted. The heating surface of the coil is much greater than would be possible within the firepot, which in a measure compensates for its lower efficiency.—Contributed by W. E. Morey, Chicago.

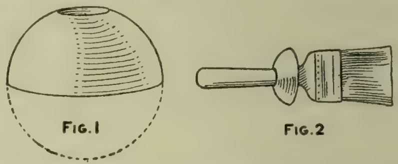
A Homemade Marking Gauge

A $\frac{3}{8}$-in. bushing is turned into the side outlet of a $\frac{3}{8}$-in. tee. The bushing is then tapped to receive a $\frac{7}{16}$-in. wing bolt. A tight-fitting wood plug is driven into the throughway of the tee and the ends ground off flush on the emery wheel. A slot, $\frac{5}{16}$-in. square, is then cut through the wood plug just under the bushing. Two pieces of flat steel, each $\frac{1}{4}$ in. wide by $\frac{1}{8}$ in. thick and $\frac{1}{8}$ in. longer than the tee, are fitted in the slot cut in the plug as shown in the sketch. The outer end of each piece is bent at right angles and sharpened. After the points have been drawn out to the right distance, the wing bolt is turned to hold them in that position.—Contributed by C. Molloy, Philadelphia, Pa.



Protecting Brush Handles from Paint

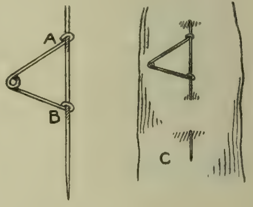
A very efficient method to prevent paint from running down on a paintbrush handle and on the hand is to cut a hollow rubber ball in half, Fig. 1, make a hole in the center to fit the brush handle and attach it as shown in Fig. 2. One ball will fit up two brushes. The cup shape catches the paint and prevents it from getting on the handle.—Contributed by O. H. Meyer, Churdon, Iowa.



The Shape of the Ball Forms a Cup to Catch the Paint from the Brush

A Tie-Pin Holder

Having lost several tie pins by theft or by their falling out I made a little device to securely hold the pin in the tie. This device makes it almost impossible to pull the pin out and it cannot be lost accidentally. The device is made of a small safety pin, bent as shown, with one arm, A, longer than the other, B. The arm A is put on the pin first or upward, and attached as shown at C. When pulling on the tie pin the arms of the holder tend to draw together and clamp it on the pin.—Contributed by Robert C. Knox, Colorado Springs, Colo.



An Electric Shaving Mug

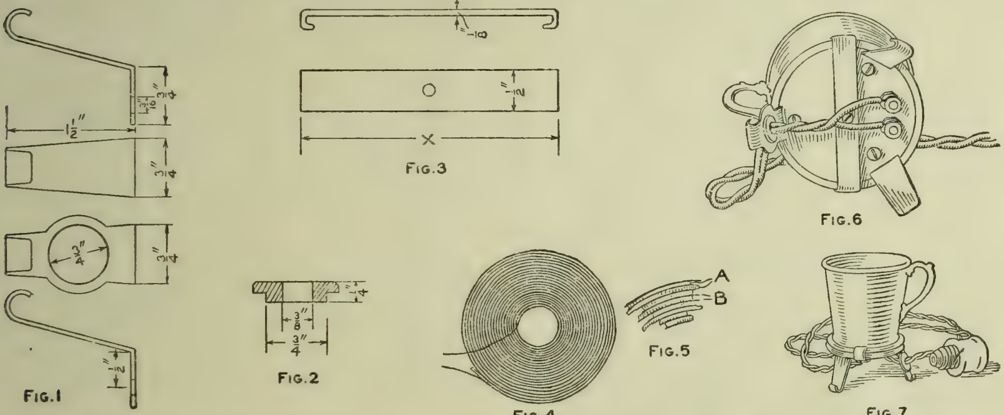
The general use of electricity in the home has opened up a new field in the way of heating and cooking utensils. While these utensils are sold by electric-supply houses, some of them can be easily made at home and answer the purpose just as nicely. One of these is the electric shaving mug.

A mug that will stand heat is the first thing required, and an aluminum cup of standard shape and design, which can be bought in almost every town, will do perfectly well. These cups are spun from a flat sheet and have no seams to open and leak, and it is necessary that no holes be drilled in the cup as it is impossible to make such a hole watertight. The heating element must be fastened to the mug with a clamp. The clamp will also allow the heating coil to be removed for repairs without injury to the mug. The bottoms of these mugs have a flange which makes a recessed part and in this the heating element is placed.

The legs of the mug are made of sheet brass as shown in Fig. 1, one of the three having an enlargement near its center with a hole for an insulating button (Fig. 2), of "transite" or some other material, to hold the supply cord in place.

The clamp for holding the heating coil in place is shown in Fig. 3. This clamp has a screw in the center to tighten it in place. The legs and clamp may be nickelplated if desired.

The heating coil is shown in Fig. 4 which is a coil of flat "Nichrome" wire, or ribbon as it is called, 12 ft. long, $\frac{1}{16}$ in. wide and 3/1000 in. thick. This is equal in cross section to a No. 26 gauge wire. To wind this coil, procure a block of wood, 7/8 in. thick and about 4 in. square, with a 1/2-in. hole in the center for an axis or pivot. Clamp a 1/2-in. rod in a vise so that the block can be rotated about it. Begin at the center and fasten one end of the ribbon to the block, leaving about 2 in. projecting for a connection, then proceed to wind the ribbon in a spiral coil, separating each turn from the preceding one with a strand of asbestos cord. A small section of the coil is shown in Fig. 5, in which A, or the light part, represents the asbestos insulation, and B, or the black lines, the heating element. The insulation may be obtained by untwisting some 1/8-in. round asbestos packing and using one of the strands. This cord insulates each turn of the ribbon from the other and the current must travel through the whole coil without jumping across from one turn to the other. The whole coil must be closely wound to get it into the limited space at the bottom of the mug.



Detail of the Parts for the Construction of an Electric Shaving Mug The Heating of Sufficient Water for a Shave can be Accomplished at a Nominal Cost

Before taking the coil from the block, rub into its surface a little asbestos retort cement, or a cement composed of a mixture of silicate of soda and silica, or glass sand. This mixture, when dry, will tend to hold the coil together and the current may be passed through the coil to test it as well as to bake it in its coiled shape.

The support for the heating coil is made of a piece of $\frac{5}{16}$-in. asbestos wood or transite. Cut it to fit into the recessed bottom of the mug, then with a chisel remove the material in the top to form a depression $\frac{1}{16}$ in. deep to receive the coil with its top flush. The leads of the coil are run through the disk. The surface of the coil is then plastered evenly with retort cement. The legs are fastened to a second piece of insulating material with roundhead brass machine screws, ½ in. long, with nuts. The heads of these screws are shown in Fig. 6, the nuts being above the brass and between the two insulating pieces.

The ends of the heating ribbon are brought through the lower insulating disk and attached to binding posts as shown. The leads may be covered with tape to prevent any short circuit.

The mug uses 3½ amperes at 110 volts, either direct or alternating current, and it will cost about 3 cents an hour to operate it. Care should be taken to use a separable attachment for connecting, as an ordinary lamp socket may be burned out by turning off the current, it being adapted only to a small capacity.

In assembling the parts, several pieces of mica should be placed between the coil and the metal of the mug to insulate the coil from the mug.

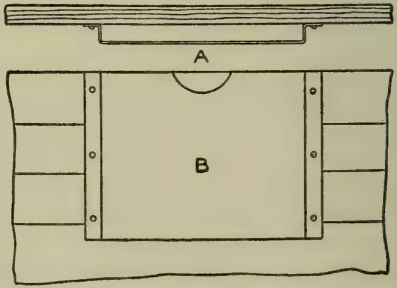
A Handbag Lock

The pickpocket finds it easy to unsnap a handbag and remove some of the contents, especially in crowded places. To make it less easy for the pickpocket, I fixed my mother's handbag as shown in the sketch. I used a chain which had served its day holding a small coin purse—any small chain will do—by passing it through the links that hold the handle and winding it once or twice around the snap fasteners to hold them securely closed.

The chain may be either shortened enough to make it convenient to hold with the handle of the handbag, or may be left long and used over the shoulder under the coat, thus making it possible to have both hands free for shopping while the handbag hangs by the side. This leaves a person free from the worry of taking care that the bag is not laid down somewhere and lost. The bag may be easily opened by unwinding the chain after loosening it by raising the bag slightly.—Contributed by Wm. Waterhouse, Aurora, Ill.

An Emery-Cloth Holder

Emery cloth in sheets is very easily spoiled around a workbench. Oil or other fluids used on work are apt to drop on it and when wet for a short time the abrasive is useless. The illustration shows a tin holder, A, that can be placed on the under side of the bench where space is not required for drawer room.



A Receptacle for Emery Cloth Made of Sheet Metal or Tin and Fastened to a Bench

The portion cut out of the bottom

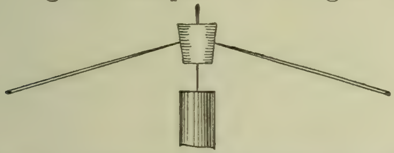
of the holder B is to enable the workman to easily grasp the sheets of emery cloth. As the holder is on the under side of the bench, there is little danger of any liquid or other substance spoiling the sheets. The sheets are also within easy reach.—Contributed by F. W. Bently, Huron, S. D.

The Operation of the Compass

After trying to tell a few small boys what a compass is, they wanted a practical illustration—something they could see. Not having a compass or knowing where to locate one handily, I used a piece of cork with needles and a needle for a pivot and found it very satisfactory. The method used is shown in the sketch.

It is best not to magnetize both needles unless care is exercised in maintaining pole relationship, or they will oppose each other and not point to the north. The extreme ends or the heads of the needles must be opposites, the head of one negative and the head of the other positive.

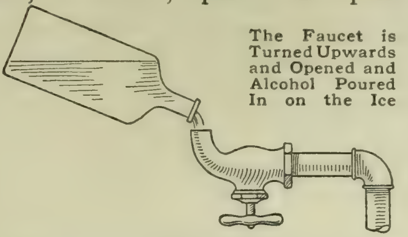
If a good compass is brought carelessly in contact with a magnet, the poles may become reversed and the north end will no longer point to the north but to the south until the current has been reversed again by bringing the opposite pole of the magnet in contact with the compass.—Contributed by W. H. Albright, Bellevue, O.


Two Large Needles in a Cork Balanced on a Central Needle to Make Them Revolve Easily

Thawing Out Frozen Pipes

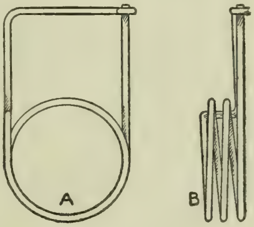
When the water pipes connecting a range boiler become frozen, get a plumber and avoid an explosion of the water back. If, however, the frozen pipe is a cold-water pipe in no way connected with the hot-water boiler, it can be thawed out as follows:

Procure some grain alcohol—not denatured or wood alcohol—and after turning the spigot upward or upside down, as shown, open it and pour in the alcohol. When the water begins to flow turn it to its proper position.—Contributed by James M. Kane, Doylestown, Pa.


The Faucet is Turned Upwards and Opened and Alcohol Poured In on the Ice

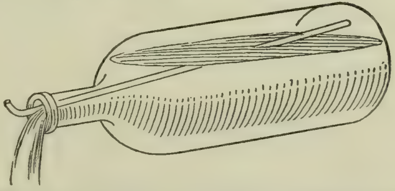
A Wire Clothespin

The pin is made of galvanized wire, A, 8 or 10 in. long, wound spirally, B, on a round surface, such as a broom handle, to make the holding part. The ends are fastened together as shown. The space between the spiral turns makes the cloth-holding part.—Contributed by Wesley H. Freeman, Palestine, Tex.



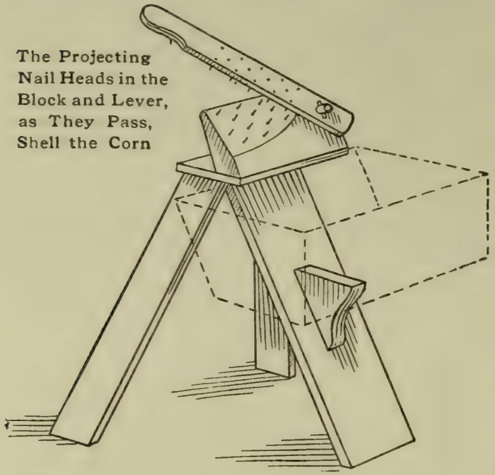
Vent for Pouring Heavy Liquids

A tube placed in a jug or bottle as shown in the sketch will assist greatly in removing molasses or heavy liquids. The tube can be placed in the receptacle without getting the liquid inside by holding a finger over the outer end. The air can easily enter without disturbing the flow of the liquid.—Contributed by Homer Payear, Owensboro, Ky.


The Vacuum Caused by the Flow of Heavy Liquids is Easily Overcome by the Air Tube

Homemade Corn Sheller

Where there is but a small quantity of corn to be shelled a sheller can be made of a few scraps of wood usually found on a farm. A block of wood having a sloping notch cut from one end is mounted on three legs as shown. The notched part as well as the lever is thickly filled with spikes driven in so that their heads protrude about ½ in.

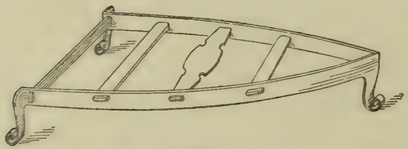


The Projecting Nail Heads in the Block and Lever, as They Pass, Shell the Corn

The ear of corn is placed in the notched part and the lever pressed down. Two or three strokes of the lever will remove all the kernels from the cob. A box is provided and conveniently located on one leg to catch the shelled corn.—Contributed by A. S. Thomas, Gordon, Ont.

An Ornamental Metal Flatiron Holder

This antique iron holder or stand can be easily constructed by the amateur bent-iron worker. A strip of iron is bent over at the ends to form the side legs, and the front leg is formed of another piece, welded in the center.



Ornamental Stand Made of Either Strap Iron or Sheet Metal to Hold a Flatiron

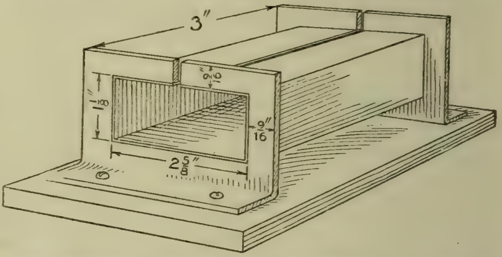
Openings for the crosspieces are then cut, the legs bent into a scroll shape, and the crosspieces inserted and fastened by spreading or upsetting the ends.

Instead of using strap iron, the stand can be cut from good sheet metal. This would save the trouble of welding on the front leg.

How to Make a Watch Demagnetizer

A watch demagnetizer that will give excellent satisfaction may be made as follows:

Procure a sheet of $\frac{1}{16}$-in. brass, 3¼ in. by 7 in. Bend this piece of brass around a piece of hard wood having a rectangular cross section of 2½ in. by 1 in. The joint between the two ends should be made on one side, and the edges should lack about ⅛ in. of touching. Next obtain two pieces of ⅛-in. brass, 3¾ in. by 3 in., and cut an opening in each of these, 2⅝ in. by 1⅛ in., as shown in the sketch. Bend one edge of each of these pieces over at right angles to the main portion of the piece. Solder these two pieces on the ends of the rectangular tube of brass and cut a slot in each of them to correspond to the one in the rectangular tube. Place the rectangular piece of wood back in the tube and you are ready for the winding. Use No. 18 gauge single cotton-covered copper wire and fill the winding space. Several layers of paper should be placed on the brass tube and between the layers of wire, to serve as an insulation. Holes may be drilled in the projecting portions on the ends and the coil can then be mounted on a wooden base. Mount two binding posts on this base and connect the terminals of the winding to them.



Dimensioned Parts for the Construction of the Core over Which the Insulated Wire is Wound

To use the demagnetizer, connect it to a 110-volt alternating-current circuit with a rheostat in circuit of such a form that the current will not exceed three amperes and that it may be reduced to practically zero in value by increasing the resistance of the rheostat. The magnetic field inside the coil is rapidly changing in direction and will tend to destroy any permanent magnetism that may be possessed by an object placed inside of it. The full current of three amperes should be allowed to pass through the winding for a few minutes after the object to be demagnetized is inserted, and then gradually reduced, and the object removed.

Remodeling a Talking Machine

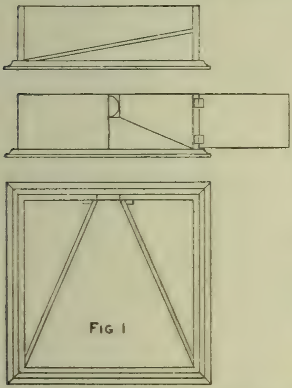


FIG I

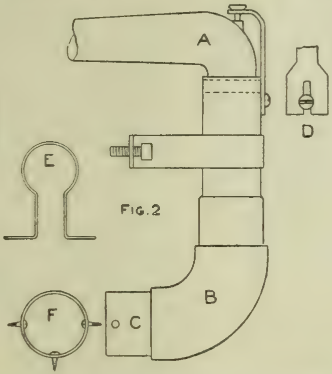


FIG. 2

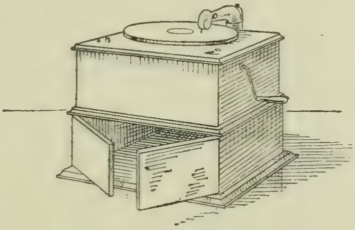


FIG. 3

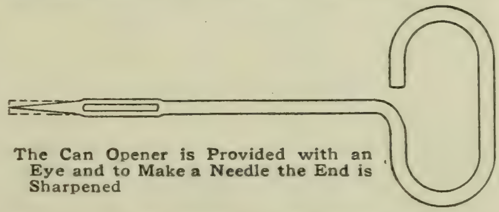
The Horn or Sounding Box is Constructed in the Auxiliary Base and the Part for Connecting the Sounding Tube to the Box Consists of Ordinary Gas Pipe Fastened with a Clip at the Back

Having a talking machine of an old model with a tapered horn I decided to change it into a more modern type, and this was accomplished as follows: An auxiliary base was constructed of ½-in. wood on which to set the part which revolves the disks. The inside of this base is so constructed as to form a horn or sounding box. The two sides and sloping bottom of the horn-part are made of ¼-in. wood. The form of this box is shown in Fig. 1. The dimensions should be determined according to the size of the talking machine.

The connecting parts to the original horn were turned downward, as shown at A, Fig. 2, with the opening entering a piece of ordinary gas pipe of sufficient length to allow an elbow with a nipple to enter the auxiliary base. The pivot-holding device for connection A is shown at D. The parts are attached to the box with a clasp, E, and with three screws in the nipple C, the end view of which is shown at F. The talking machine is placed on the auxiliary base as shown in Fig. 3. This construction produces a talking machine on the order of a cabinet machine without the tapering horn.—Contributed by H. W. J. Lomglatz, Harrisburg, Pa.

Needle for Sewing Burlap

A needle for sewing burlap can be easily made of the ordinary opener that comes with sardine cans. All that is necessary to convert this tool into a needle is to grind the blunt end to a sharp point, as shown in the sketch.—Contributed by G. C. Beven, Sault Ste. Marie, Ont.


The Can Opener is Provided with an Eye and to Make a Needle the End is Sharpened

A Homemade Mailing Tube

A photograph or manuscript may be sent through the mail unmounted without the danger of being broken by placing it in a tube made as follows: For an 8 by 10-in. photograph procure a piece of cardboard 6 by 10 in., plain mounting board preferred, and cut halfway through the card in three places as shown by the dotted lines in Fig. 1. Then fold it in a triangular shape as shown in Fig. 2. It is easy to make such a tube to fit any photograph or manuscript to be mailed.—Contributed by A. H. Schaefer, Buffalo, N. Y.

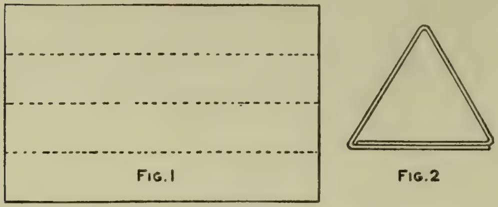
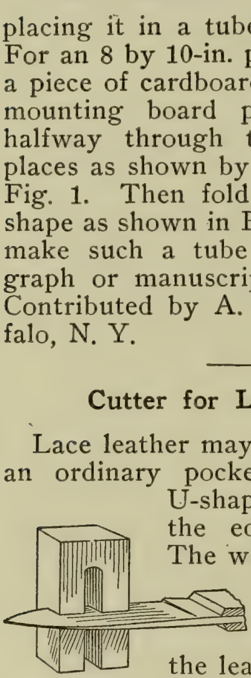


FIG. 1 FIG. 2

The Bends in the Cardboard are Made on Lines Equal Distances Apart to Form a Triangle

Cutter for Lace Leather

Lace leather may be easily cut with an ordinary pocket knife having a U-shaped block fitted on the edge of the blade. The width of the opening should be exactly the same as the thickness of the leather and the width of the lace is determined by the distance between the blade and the depth of the notch. Several places can be provided for the blade to cut different widths of lacing.—Contributed by A. K. Runkle, Kinsman, O.



Refinishing Chairs

When refinishing chairs, a good way to get at the bottom part is to turn the chair upside down and place its seat on the seat of another chair. The legs and rungs can thus be easily cleaned and varnished.—Contributed by A. Mandeville, Ware, Mass.

An Electric Gas Lighter

A very simple and inexpensive electric gas-lighting device is shown in the accompanying illustration. The gas is ignited by means of an electric spark which is produced between the two parts A and B of an electric circuit. This circuit is composed of a source of electrical energy, such as a number of dry cells, a kick coil, the connecting leads, and a special operating switch for opening and closing the circuit to produce the spark. The circuit is normally open, but as the lever controlling the gas valve is moved from one position to the other, by pulling the chains, the lever C is caused to move through a certain arc. Now, as this lever C moves, its upper end passes the projecting point B, which is attached to the upper portion of the burner, and the electric circuit will be completed and broken. Just as the point A leaves contact with the point B an arc will be produced. This arc is greatly intensified by the kick coil, which acts as a sort of reservoir in which energy is stored while the circuit is closed, and upon opening the circuit this stored energy is given out by the kick coil and increases the size of the arc.

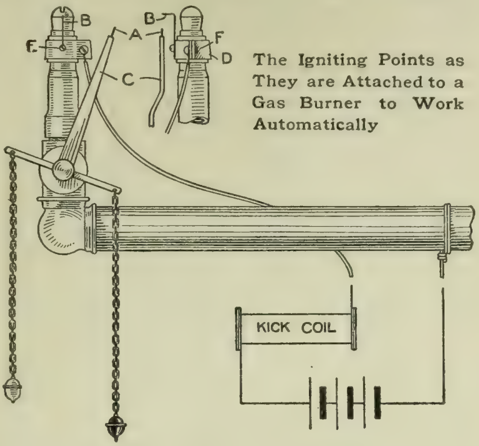
The points A and B should both be made of platinum, as other metals will not withstand the extremely high temperature of the arc. Pieces of platinum that will serve very nicely for the purpose may be obtained from an old incandescent lamp. The piece B is mounted on a brass collar, D, by means of a small screw, E. The brass collar D is held in place by the screw F, which draws the two ends together. This collar must be insulated from the stem or fixture by some thin sheets of mica. The upper end of the piece of platinum B should be just high enough to come within the lower edge of the gas flame.

Now mount an arm, C, on the valve stem so that it stands in a vertical position when the lever to which the chains are attached is in a horizontal position. Bend this arm into the form shown in the figure and cut its upper end off so that it is about ½ in. below the outwardly projecting end of the piece of platinum B. Drill a small hole in the upper end of C, and insert a piece of platinum and run some solder around it.

Then the complete burner and valve are mounted on the gas fixture, and from the collar D an insulated wire is run to the point where the battery and kick coil are to be located. The gas fixture itself is to form one side of the electric circuit, and one terminal of the battery should be connected to the gas pipe as shown in the figure.

A kick coil may be made as follows: Procure a small quantity of rather small soft-iron wire and cut a sufficient number of 8-in. lengths to make a bundle about ⅞ in. in diameter. From some good writing paper make a tube, 8 in. long and ⅞ in. in outside diameter. Use at least six layers of paper and glue the various layers together in forming this paper tube. After the tube has dried thoroughly, fill it with the pieces of iron wire until it is perfectly hard. Cut from some ½-in. hard wood, two pieces, 3 in. square, and drill a ⅞-in. hole in the center of each of these to a depth of ⅜ in. Now glue these pieces to the completed core and the winding can begin as soon as the glue is dry. Wind on this spool six layers of double cotton-covered No. 18 gauge wire, insulating the various layers from each other with several thicknesses of good writing paper. This coil is then mounted on a wooden base and suitable terminals provided.

At least four dry cells will be required to give satisfactory results. Bear in mind that the gas must be escaping from the burner when the arc is formed. The adjustment of the arm A, as given above, may result in the gas valve being closed when the arc is formed, and the device will then fail to operate. If this is the case, the arm C should be loosened and moved back so that the circuit is broken at a later time while the valve is being moved from the "off" to "on" position. The circuit should be closed for some little time before it is opened so that some energy may be stored in the kick coil. If the wire A is made long enough to project a short distance above B, it will result in the circuit being closed for a longer time than it would if they just touched.



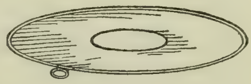
The Igniting Points as They are Attached to a Gas Burner to Work Automatically

Stretching Tight-Fitting Shoes

A tight-fitting shoe can be stretched by filling it tightly with oats dampened in water and packing some old paper in the top. The grain will quickly swell and, as the leather will get softened by the dampness, the shoe will be rapidly stretched. Allow time for the oats to dry out before removing them.—Contributed by Fred L. King, Islip, New York.

Pad for a Percolator

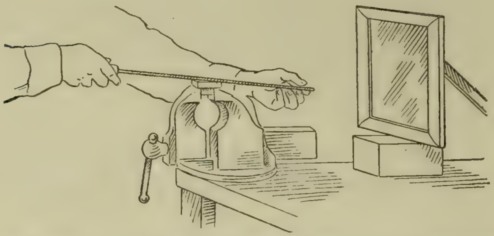
To prevent heating the bowl of a percolator and burning the handle, as often happens when it is placed on a stove, use an ordinary asbestos pad with a hole cut in the center as shown, just large enough to admit the foot of the percolator.—Contributed by Mrs. G. W. Coplin, Bay City, Mich.



ℭIf a motorcycle engine is raced while on the stand, the cylinder will heat, often with the result that it is ruined.

Filing Flat Surfaces

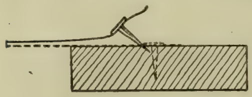
Anyone who has used a file knows what skill is required to produce flat surfaces. A fixture which is nothing more than a mirror properly placed enables the operator to sight along the file and see at all times just how the file is running.—Contributed by A. F. Stearns, Madison, Wis.



The File can be Seen in the Mirror and Its Direction Controlled for Filing Flat Surfaces

Tacking a Screen on a Frame

Screen wire is very difficult material to fasten on a frame so that it becomes taut. To make it taut and even drive the tacks as follows: First tack the screen on one side of the frame, taking care to leave no slack between the tacks, which should be about 1 ft. apart. Fasten the opposite side by stretching the screen with one hand and with the other place the tack through the meshes and push the point as far as possible toward the outer edge of the screen frame as shown in the sketch. Drive the tack so that it will enter the wood straight, which will draw the screen taut. After having thus fastened the screen to two opposite sides of the frame with tacks 1 ft. apart, other tacks are driven in midway between the first ones, stretching the screen and driving the tacks as before described, until a sufficient number of tacks are driven into either side. Then both ends are attached in the same manner.—Contributed by Bertram S. Barnes, Santa Barbara, Cal.



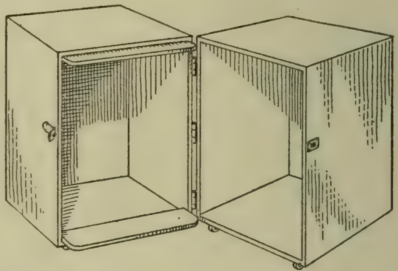
Safety Tips on Chair Rockers

Some rocking chairs are so constructed that when the person occupying it gives a hard tilt backward, the chair tips over or dangerously near it. A rubber-tipped screw turned into the under side of each rocker, near the rear end, will prevent the chair from tipping too far back.

Portable and Folding Bookcase or Closet

Two packing boxes hinged as shown and fitted with casters make a very convenient portable closet. It can be folded flat against a wall or fitted into a corner. If furnished with shelves, it can be used as a bookcase or tool closet, and when fully opened, it makes a handy workbench.

Two projecting strips are fitted on the inside of one box so as to fit tightly against the inner top and bottom surfaces of the other box, to increase the rigidity of the box when closed. The addition of casters makes the opening, closing and pushing about very easy. An ornamental hasp or lock can be fitted if desired.



The Two Boxes are Joined on One Edge with Hinges and with a Hasp, if Desired, on the Other

A Curtain Stop

A small screweye turned into the bottom part or wood strip inclosed in the lower end of the curtain will prevent this end from winding over the top roller when the curtain is quickly released and rolls to the top.—Contributed by D. O. C. Kersten, Detroit, Michigan.

PATENTS, PRACTICAL OR UNIQUE

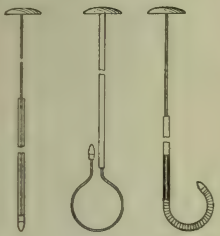


FIG. 1

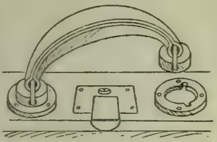


FIG. 2

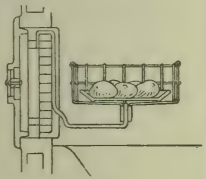


FIG. 3

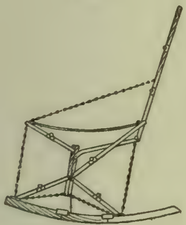


FIG. 4

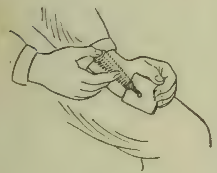


FIG. 5

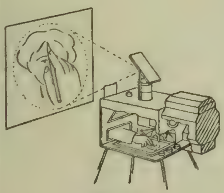


FIG. 6

SAFETY HATPINS (British patent)—A safety hatpin, rather ingenious in construction, is shown in Fig. 1. It is a hatpin having a point adapted to be turned into a position of safety after insertion. The point of the pin is mounted upon a flexible portion normally curled out of alinement with the shank, but adapted to be straightened either by means of an external tube as in the first two drawings, or by an internal wire, as in the third.

DETACHABLE HANDLE FOR HAND BAGGAGE—Believing that a dress-suit case or other form of hand baggage having no handle is less likely to be stolen when set down in a railroad station or public conveyance, a western inventor has designed the detachable handle shown in Fig. 2.

COOKER ATTACHMENT FOR FURNACE DOORS—Cooking over the coals of the furnace is made possible by the apparatus illustrated in Fig 3. It comprises a swinging arm designed for attachment to the inside of the furnace door, and a food holder that may be attached securely to the arm.

POCKET FOLDING CHAIR—Chairs that may be folded up into exceptionally small spaces for carrying are numerous, but the folding chair shown in Fig. 4 is somewhat unusual in that it is of the rocker variety. The specifications state that this chair can be carried in the coat pocket when folded up.

TURKEY CALL—Figure 5 illustrates a bird call which imitates the note of the wild turkey. It comprises a tone tube and a stylus needle with a body portion which gradually tapers into a thin blade, having a head at its end. When this needle is placed against a piece of slate, or the like, in frictional contact, and moved along it, the vibration set up in the blade produces a sound imitating the wild turkey's cry.

APPARATUS FOR PROJECTING PICTURES DURING PRODUCTION—Figure 6 shows an interesting apparatus by means of which an enlargement of a drawing may be projected on the screen while it is being drawn. The means by which this is accomplished is clearly illustrated in the drawing.

CALF WEANER—That the mesh of steel links most commonly known for its use as a steel wash cloth for the cleaning of steel and tinware in a kitchen, may have other uses is illustrated by Fig. 7, which shows a calf weaner.

DEVICE FOR EXAMINING THE INTERIOR OF PIPES—An electric lamp of the self-contained battery type, especially arranged for use in examining the interior of pipes is shown in Fig. 8. Curved springs radiating from the lamp keep it sufficiently spaced from the walls of the pipe to permit a practically unobstructed view past it on all sides. The lamp is drawn through the pipe by means of a light cable.

PHOTOGRAPHIC-FILM WASHER—Figure 9 illustrates a photographic-film washer adapted for use in the bathroom. It comprises a cylindrical body to which the films are attached, a bracket over the bathtub for suspending the cylinder, and a hose connection to the faucet supplying the tub with water.

FLEXIBLE METALLIC FINGER COT—A flexible metal protection for a sore thumb or finger is shown in Fig. 10. The so-called "cot" is composed of flexibly connected U-shaped metal links, provided with an extension which fastens around the wrist.

PICTURE-SUSPENSION BAR — A picture-hanging device, consisting of a single piece of metal having a hook at one end to engage the picture rail, a main vertical bar to rest flat against the wall, and a wide curved loop to support and give a slanting position to the frame, is shown in Fig. 11.

SIGHT EXTENSION FOR AUTOMATIC PISTOLS (British patent)—The difficulty of obtaining a good sight at the object aimed at with an automatic revolver, due to the shortness of the barrel, has led an English inventor to mount the sights on sliding extensions, as shown in Fig 12.

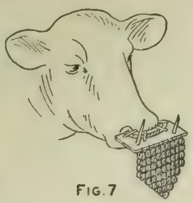


FIG. 7

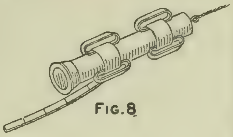


FIG. 8

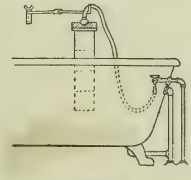


FIG. 9

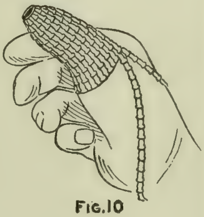


FIG. 10

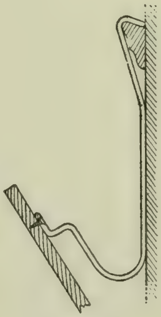


FIG. 11

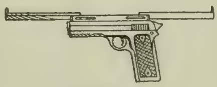


FIG. 12

"I'VE been reading an article on electricity, John," said a gossiping woman to her husband, as she laid down a copy of a technical journal she had been perusing, and looked over her glasses at her better half. "And it appears that before long we shall be able to get pretty well everything we want, by just touching a button."

"It will never pay here," growled the husband. "You'd never be able to get anything in that way."

"Why not, John?"

"Because nothing on earth would ever make you touch a button. Look at my shirt!"—Electric City.

◆ ◆ ◆

"Pa, what are fortunes of war?"

"The moving picture rights, my boy."—Detroit Free Press.

◆ ◆ ◆

While awaiting the coming of her friend, the mother, a visitor to a Baltimore household, was holding a desultory conversation with one of the little girls in the drawing room.

"Where are your two little sisters?" the caller asked.

"Oh, they," observed the little girl, with an air of one upon whom the responsibilities rest heavily, "they're out somewhere to have what mother calls mischief, and what they call fun."

"And why didn't you go to share in the fun?" asked the caller.

The child sighed. "Mother trusts me so dreadfully," she explained, "that I can't have much fun."—Lippincott's.

◆ ◆ ◆

"What a picturesque place this is, this fork in the roads!"

"Yes; it is where the hotel couples spoon."—Exchange.

◆ ◆ ◆

"Have you purchased your new car yet, Mrs. Noorich?" asked the visitor.

"No, Mr. Smithers, I ain't. I can't make up my mind whether to get a gasoline car or a limousine car. Maybe you can tell me—does limousine smell as bad as gasoline?" inquired the lady. — Harper's Weekly.

Courtesy of Motor, London

THE LAST STRAW

Pilot: "Ever been up in an aeroplane before?"
Passenger: "N — never!"
Pilot: "Neither have I!"

◆ ◆ ◆

Wah—Are you sure Speade did the "hundred" in 10 flat?

Hoo—Certainly. I timed him with my watch.

Wah—Oh, well, that's only a "second-hand" proof. —Jack-o'-Lantern.

◆ ◆ ◆

"So he took you out auto riding the other evening?"

"Yes. What of it?"

"Do you think he is in love with you?"

"I think so. I know that every time I spoke to him, the auto tried to climb a tree or jump a fence."—Leslie's Weekly.

◆ ◆ ◆

New Merchant—How big an "ad" would you advise?

Advertising Man—That depends on how many tons of customers your store floor will sustain. You wouldn't want 'em to break through into the cellar, of course!—Electric Traction.

Litigant—Your fee is outrageous. Why, it's more than three-fourths of what I recovered.

Lawyer—I furnished the skill and the legal learning for your case.

Litigant—But I furnished the case.

Lawyer—Oh, anybody can fall down a coal hole.—Boston Transcript.

◆ ◆ ◆

"What do you think of the war?"

"What war?"

"The war in Tripoli."

"I really can't say; I haven't seen any of the films."—Louisville Courier-Journal.

◆ ◆ ◆

"How was it the thieves got away with that roll of carpet?"

"I suppose they beat it."—Baltimore American.

◆ ◆ ◆

Salesman—Here you are, gentlemen—the greatest invention of the age!

Passer-by (stopping to listen)—What is it?

Salesman—A magnetized keyhole-plate for front doors. It will attract an ordinary steel key from a distance of two feet. All you have to do to find the keyhole at night is to take out your key and hang on to it.

Three men were injured in the crowd that rushed to buy.—The Sphynx.

◆ ◆ ◆

"Is your chauffeur an expert?"

"Yes, indeed," replied Mr. Chuggins. "He can explain in a most interesting way exactly why the car isn't running most of the time."—Washington Star.

◆ ◆ ◆

Caretaker—There's a gentleman bin about the 'ouse this morning, sir.

Agent—Ah! is he going to take it?

Caretaker — Well, I don't know, sir; but 'e's took the electric-light fittings.—The Tatler.

◆ ◆ ◆

Mother—Now, Willie, you know I told you not to go in swimming, and yet you have been in the water.

Willie—I know it, ma, but Satan tempted me.

Mother—And why did you not tell Satan to get behind you?

Willie—I did, and he kicked me in.

◆ ◆ ◆

Motormaniac—What do you think is the most difficult thing for a beginner to learn about an automobile?

Frankenstein—To keep from talking about it all the time.—Toledo Blade.

◆ ◆ ◆

Visitor—I came all the way from the city to consult your lawyer Jones here. He's a good man, isn't he?

Uncle Eben—Nope; we don't consider him one, two, three, with Smith. Why, Smith's been intrusted with the local agency of the Knot Knitting Needle, the dispensing of Daggett's Drugless Dope, and the demonstrating of Fasset's Fireless Cooker. That not only shows that he's got the confidence of such big fellows as them, but he don't have to depend on his law hardly at all to make a living.—Lippincott's.

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WRITTEN SO YOU CAN UNDERSTAND IT

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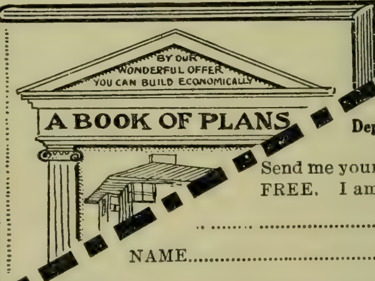
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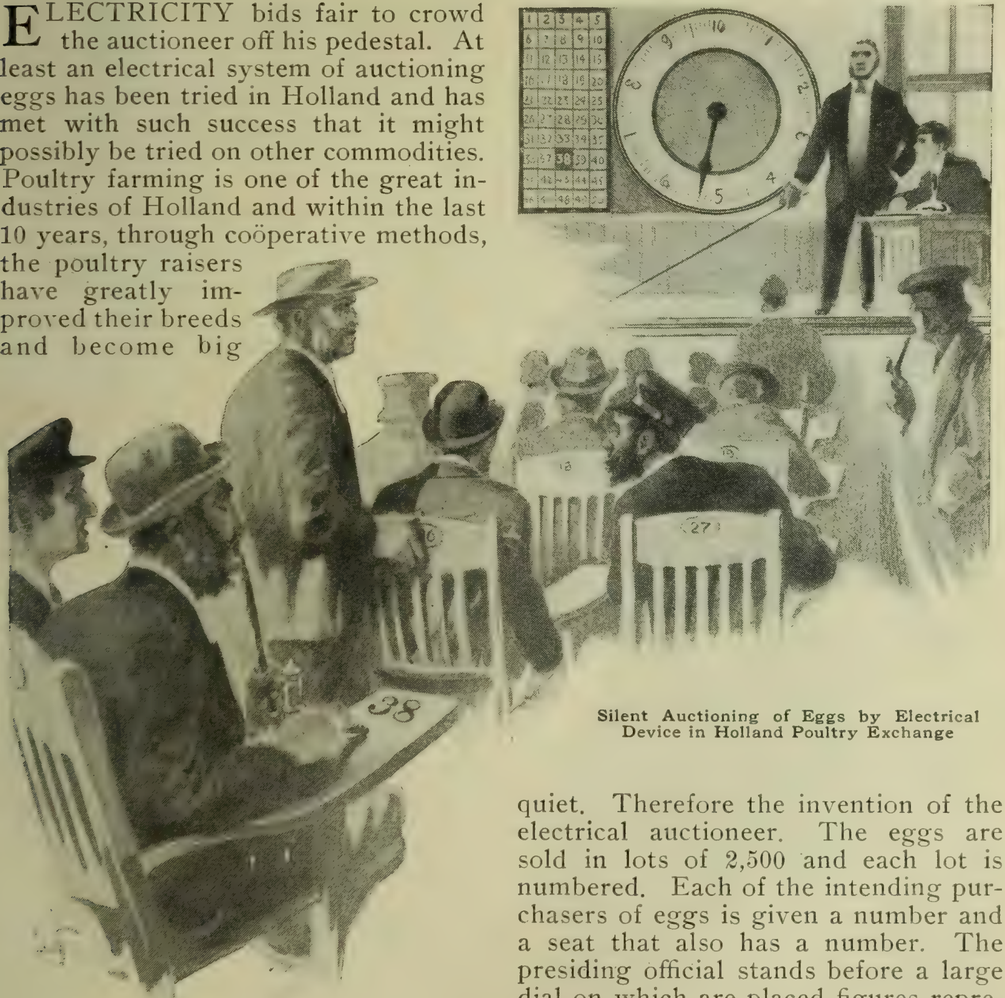
Vol. 18 DECEMBER, 1912 No. 6

Electricity Supplants the Auctioneer

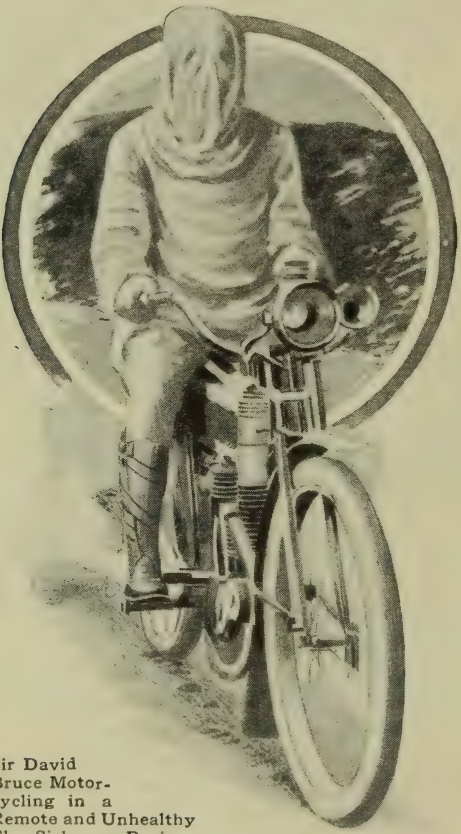


Silent Auctioning of Eggs by Electrical Device in Holland Poultry Exchange

ELECTRICITY bids fair to crowd the auctioneer off his pedestal. At least an electrical system of auctioning eggs has been tried in Holland and has met with such success that it might possibly be tried on other commodities. Poultry farming is one of the great industries of Holland and within the last 10 years, through coöperative methods, the poultry raisers have greatly improved their breeds and become big producers. The eggs are sold at auction every Saturday in at least one of the centers of the chicken industry, and the noise and confusion of the egg market on salesday did not sit well with the Dutchman's love of peace and quiet. Therefore the invention of the electrical auctioneer. The eggs are sold in lots of 2,500 and each lot is numbered. Each of the intending purchasers of eggs is given a number and a seat that also has a number. The presiding official stands before a large dial on which are placed figures representing prices, ranging from a very high figure to one that is correspondingly low. Beside the dial is an annunciator which is connected with push buttons on the seats, each having one button. The presiding official announces the number of a lot of eggs with a statement of their weight, etc., and then sounds a bell. At this signal a pointer begins moving slowly around the dial, commencing at the high figures and dropping to the lower. When the dial reaches the price a prospective purchaser desires to offer, the purchaser presses the button on his chair, the pointer stops, a bell rings and the purchaser's number flashes on the annunciator. There is no noise and no confusion. The sturdy Dutch broker sits at ease and waits for the pointer to reach his price. When a sale has been made in this fashion, a new lot is announced and the same process followed in disposing of it.

"SLEEPING SICKNESS" AND MOTORCYCLING

Among the first photographs to reach Europe and America of the sleeping-sickness campaign in Nyassaland is one that shows Sir David Bruce riding a motorcycle and wearing a special costume as a protection against the fly that carries the terrible scourge. Nyassaland is in a remote and unhealthy region of Central Africa and the use of a motorcycle there, and especially as an accessory in the investigations of the sleeping sickness, is an interesting detail.



Sir David Bruce Motorcycling in a Remote and Unhealthy Fly-Sickness Region

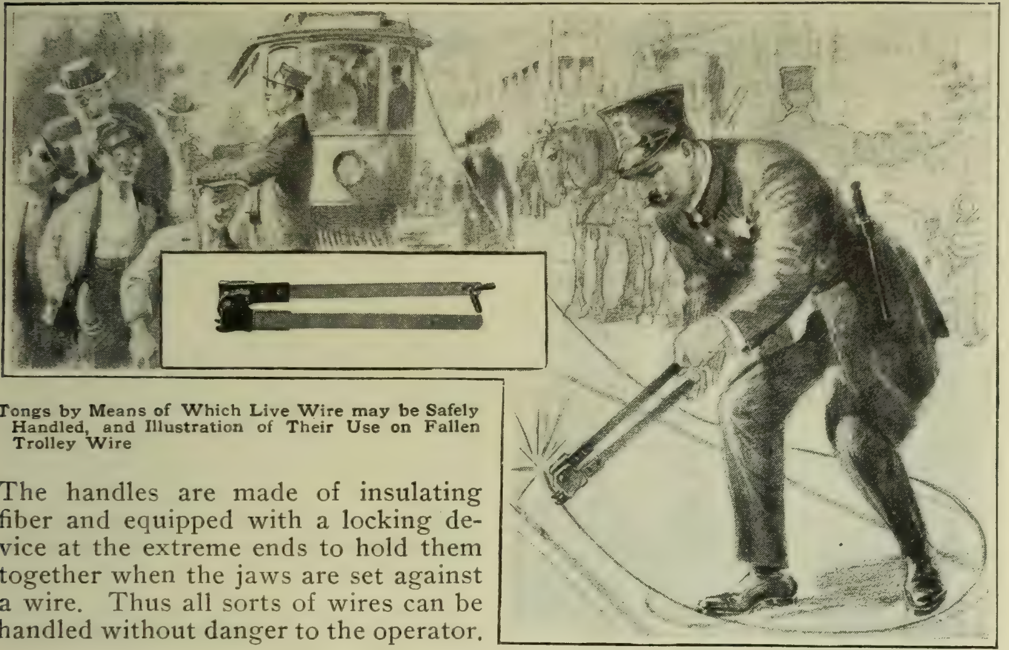
The flies come at one like a swarm of angry bees, attacking in thousands, and when motorcycling, it is impossible to protect oneself except by thick veils and gloves.

DYNAMO THAT COULD REST ON A COPPER CENT

What is believed to be the smallest electric dynamo in the world, so small it could be placed on an American penny and not occupy all the space, was recently exhibited before the French Academy of Science. The instrument is a perfect miniature of a large machine, and though it is a practical model in all respects, working with a hum that sounds like the buzz of an insect, it weighs only 1/5 oz. and is but .6 in. in height and length, being a little short of this in thickness. It can be used not only as a generator but also as a motor, consuming in the latter case, 2 amperes of electric current at a pressure of 2.5 volts, and being easily operated by a small pocket battery. Every detail of the machine is accurately made.

TONGS FOR HANDLING LIVE WIRES WITH SAFETY

In electric-lighting plants and other places where handling of live wires is necessary, there is always danger and difficulty present in picking up wires carrying heavy currents. Tongs have recently been invented which are so made that they can be used for either large or small wires, being equipped with two sets of jaws for that purpose.



Tongs by Means of Which Live Wire may be Safely Handled, and Illustration of Their Use on Fallen Trolley Wire

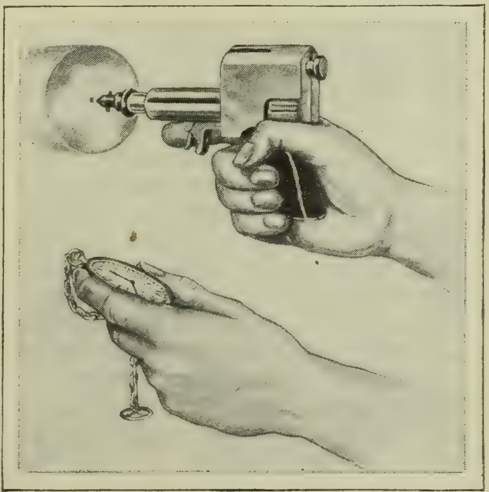
The handles are made of insulating fiber and equipped with a locking device at the extreme ends to hold them together when the jaws are set against a wire. Thus all sorts of wires can be handled without danger to the operator.

FILTERED-WATER BASIN YIELDS FISH

Believing that the fish were becoming too numerous in the filtered-water basin of the Ludlow reservoir of the Springfield, Mass., water system, the Massachusetts Fish and Game Commission was given the privilege of seining it to get a supply of fish for the new state hatchery. The net yielded several large hauls of bass, perch, pickerel and bullheads, according to the Fishing Gazette.

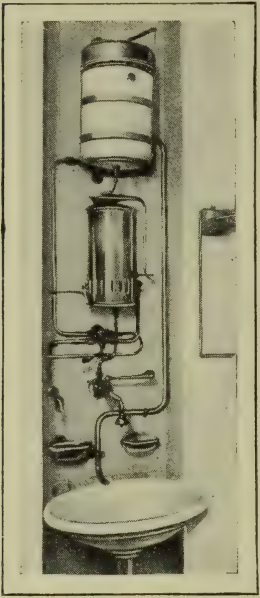
COUNTS REVOLUTIONS AS TRIGGER IS PRESSED

An apparatus for counting the revolutions of a shaft has recently been invented, which is shaped somewhat like an automatic pistol, and is said to be much more accurate and easily read than the usual type of instrument made for this purpose. The counting device is so arranged that it does not begin to record until the trigger is pulled. The spindle, which revolves with the shaft, is held against the latter and is so delicately adjusted that it makes no difference how much or how little pressure is used. As soon as the trigger is pressed, the recording apparatus begins to work and continues counting until the pressure on the trigger is released. The figures on the recording device are large and show plainly.



Revolution Counter Shaped Like an Automatic Pistol

SMALL ULTRAVIOLET-RAY WATER PURIFIER



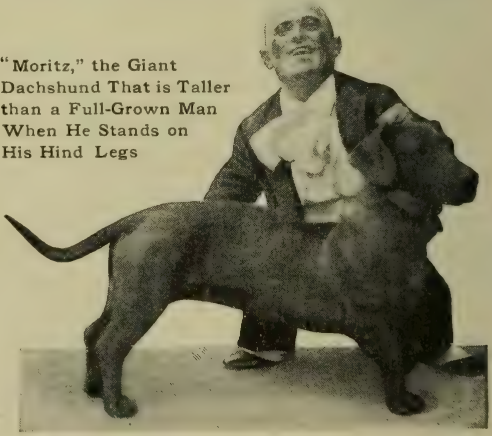
In the accompanying illustration is shown a small ultraviolet-ray water purifier, designed especially for office buildings, homes, libraries, schools, and the like. This type of purifier is coming into general use in Paris, the illustration shown being, in fact, that of the Paris commercial high school. It purifies all the drinking water required for 250 persons. The installation of this type of sterilizer is very easy, being effected by simply connecting it with the source of electric supply and with the water mains. An automatic device cuts off the supply of water should there be no current in the lamp. The radiations from the lamp, immersed in the tank or channel into which the water flows, kill all the disease germs.

THE WAY HUMANITY TAKES ITS DAILY WALK

The curiosity of scientists would seem to be far greater than the supposedly innate desire to know of the fair sex, and some of the things that science evinces the greatest curiosity about may appear quite trivial to the layman. Yet results are attained that are surprising. It probably never occurred to the average person that when he walks uphill a short distance, his steps are slightly slower on the succeeding level than on the level before he struck the hill, nor that while a man does not slacken his speed walking up a hill until he has gone several steps, a woman recognizes the existence of the impediment and slows down immediately. Science has determined this to be a fact, however, by careful investigations in New York City. The investigations did not extend to steep hills or grades, but only to the level sidewalk and to slight elevations which would hardly be noticed. It was found that on the level a man moving with the normal step will require an average of 14 sec. to cover a distance of 100 ft. while a woman does the distance in 20 to 22 sec. After climbing a slight gradient the time of a man was found to be increased to 17 to 21 sec., and a woman to 21 to 25 sec. The slowing down occurs not only on the actual gradient, but for some 100 ft. beyond.

GIANT DACHSHUND BIGGER THAN A MAN

The dachshund is one of the standard butts for comic-supplement jokes, the extreme length of the little dog compared with his height giving him physical characteristics that appeal to the limner of humorous pictures. Heretofore the artists, in this country at least, have had only dogs of the smallest size to use as models for their skill. Europe, however, has recently been shown a dachshund that is of giant size and retains all the features of his breed. This dog measures 5 ft. 8½ in. from the tip of his nose to the tip of his tail,



"Moritz," the Giant Dachshund That is Taller than a Full-Grown Man When He Stands on His Hind Legs and when he stands on his hind legs he is taller than an average-size man. He answers to the name of "Moritz" and is said to be possessed of immense strength, which, however, is combined with a very sunny disposition.

SCARCITY OF PHYSICIANS IN CHINA

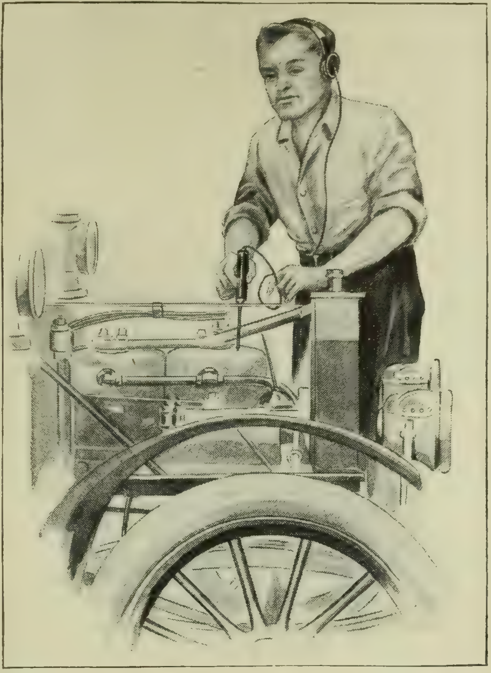
The number of physicians in the whole Chinese Republic is scarcely more than 3,000, according to Dr. M. R. Edwards, head of the Shanghai branch of the Harvard Medical School. Of this number approximately 2,000 are trained native physicians, and 1,000 foreign physicians.

One of the important departments of the Shanghai branch of the Harvard Medical School is that of preventive medicine, and its purpose is to educate native public-health officials. It is these officials who can best overcome the prejudices of the ignorant classes in time of pestilence and epidemics.

STETHOSCOPE TO STUDY MOTOR AILMENTS

Science and mechanics recently have formed the habit of borrowing terms and processes from each other to such an extent that when one uses a term it is difficult to tell whether the statement refers to a motor car or to locomotor ataxia, which expression, by the way, is itself significant as to just how far this interchanging of phraseology has gone.

The newest example of the kind has been brought to light in the shape of the mechanical stethoscope. The surgical stethoscope, as everyone knows, is for the examination of the chest, and by its application the skilled surgeon gains much useful information as to the condition of the heart and respiratory organs. Similarly, with the mechanical stethoscope, the skilled mechanician can determine the condition of an automobile motor by the sound. It is often remarked that a man familiar with a certain motor car can detect the faintest change in the ordinary running of his motor by the sounds that are made by it. Sometimes these sounds are hardly perceptible and would not be heard at all—or at least would not be associated with any trouble by the uninitiated. However, the sounds tell, and the motorist frequently stops his car to locate a "knock" in some part of the machine. The new stethoscope has been devised to enable him to locate the trouble with a greater degree of accuracy. It consists of an ordinary microphone and a highly sensitive telephone receiver. The microphone and the battery supplying current are housed in a cylinder and are attached to the telephone receiver by a flexible cord. The latter has a headpiece like that of a telephone operator, thus leaving the hands free. The microphone is equipped with a metal rod which is pressed against the motor while it is running, and from the vibrations the rod receives and transmits to the microphone the point where the motor is running unevenly can be invariably detected.



Stethoscope to Locate Various Kinds of Engine Trouble

INDIAN DUGOUT CANOES BECOME MOTORBOATS

The primitive Siwash dugout canoe is still used in great numbers by the Indians of the Northwest, especially on and around Puget Sound, but any Indian, good or otherwise, who can buy or borrow a small gasoline engine bids farewell to the paddle of his forefathers and "put-puts" everywhere.

All over the Sound, according to a writer in the Pacific Motor Boat, the slash of the paddle is being replaced by the pop of the gasoline exhaust pipe. The little four or five-horsepower engine is the modern substitute for squaws in these ancient boats. When the white man goes out in a power canoe he takes along a sail and oars or paddles, for fear the engine might stop. The true Indian, on the other hand, scorns these things. He opens the gasoline valve, sets the spark, gives the wheel a yank and away he goes. When he gets there he stops the engine. The muffler is a non-essential, as he loves noise, and he will take an old engine a white man cannot run and make it go successfully.

¶The omnibus is dead, long live the omnibus, says Le Figaro, in advocating that since the old-type omnibus now has practically disappeared, this familiar appellation should be applied to the modern motor-propelled vehicle instead of the ill-chosen name "autobus."

TRAIN STRIKES HEAVIER BLOW THAN GUN

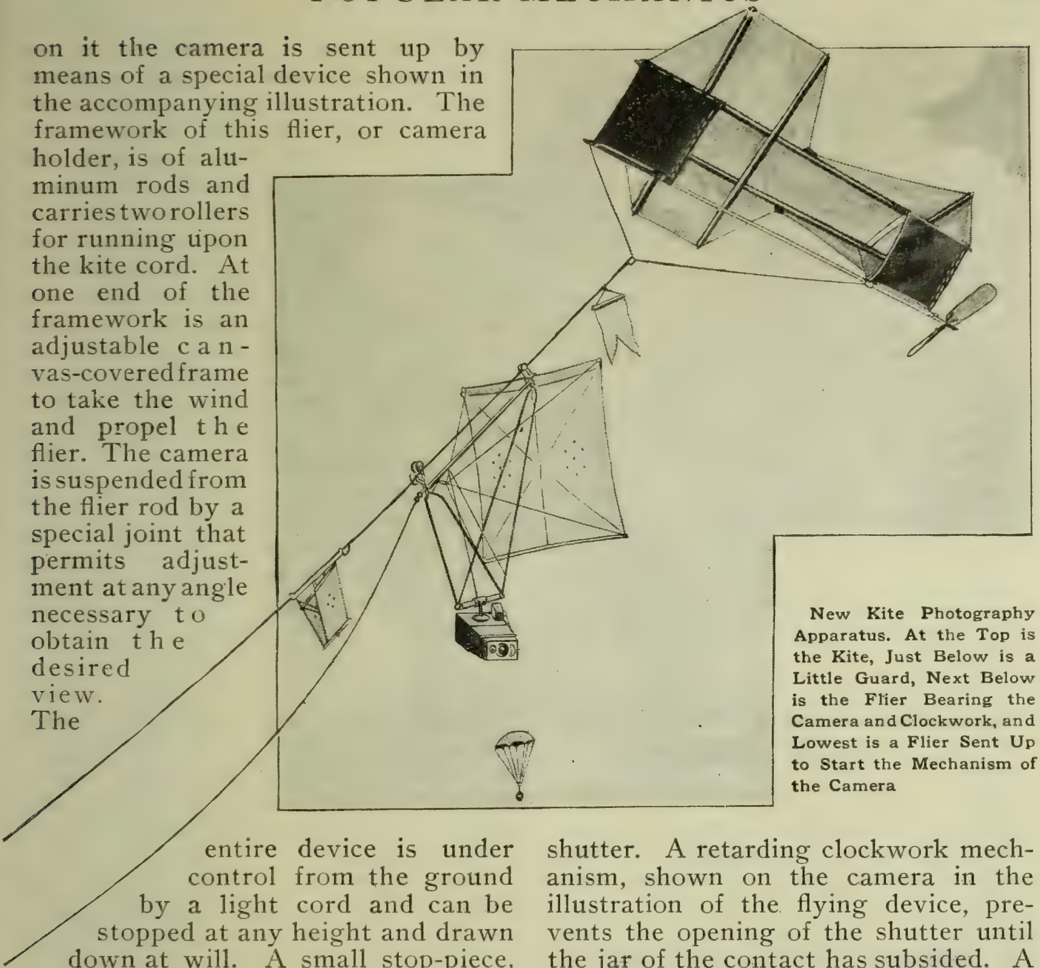
The force of the blow struck by a modern train going at high speed is greater than that of the shot from a modern gun. At least such is the statement of a scientist who has been looking into this question. He estimates that a modern passenger train will weigh about 400 tons and that it moves at a velocity of 70 to 75 miles an hour, or about 100 ft. a second. A mass of 400 tons propelled at this velocity will strike a blow twice as great as that delivered by a 2,000-lb. shot fired from a 100-ton cannon. This, he states, accounts for the tremendous destruction caused by collisions.

PRACTICAL KITE PHOTOGRAPHY

A kite and camera device recently perfected by M. Meifred-Devals, a Paris engineer, has made aerial photography practical and comparatively easy for engineers, surveyors, mapmakers, explorers, military observers and others who appreciate the great value of a bird's-eye view of the district they may be working in. The equipment is portable, and the work done with it not long ago in the Tyrol by M. De Payer demonstrated its worth to working parties in the field in obtaining knowledge of the country for several miles around in a half-hour's time.

The kite is of an improved box pattern, with side stabilizing wings, has great ascensional force, and the surface can be adjusted to suit the strength of the wind. In flying, it is attached by a cord to a portable windlass. When the kite reaches a height of from 1,000 to 1,500 ft., the cord becomes steadily stretched and

on it the camera is sent up by means of a special device shown in the accompanying illustration. The framework of this flier, or camera holder, is of aluminum rods and carries two rollers for running upon the kite cord. At one end of the framework is an adjustable canvas-covered frame to take the wind and propel the flier. The camera is suspended from the flier rod by a special joint that permits adjustment at any angle necessary to obtain the desired view. The entire device is under control from the ground by a light cord and can be stopped at any height and drawn down at will. A small stop-piece, flying a pennant, is fixed on the kite cord to prevent flier and kite from colliding. When flier and camera have reached the proper height, a second, lighter frame is sent up, strikes a lever on the flier and releases the camera shutter. A retarding clockwork mechanism, shown on the camera in the illustration of the flying device, prevents the opening of the shutter until the jar of the contact has subsided. A small parachute, released at the same time, indicates that the exposure has been made. The flier is then pulled down and may be sent up again to take other views without disturbing the kite.



New Kite Photography Apparatus. At the Top is the Kite, Just Below is a Little Guard, Next Below is the Flier Bearing the Camera and Clockwork, and Lowest is a Flier Sent Up to Start the Mechanism of the Camera

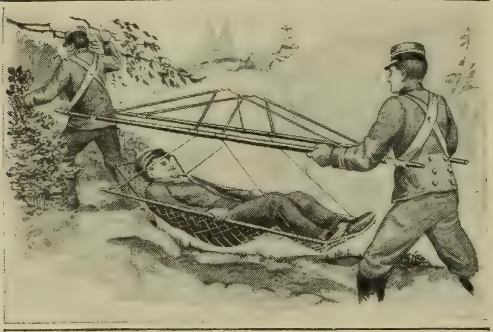
MACHINE-MADE MUSIC FOR MOVING PICTURES

A large number of the patrons of moving-picture shows stand amazed at the selection of music that keeps pace with the whirl of the reel and the thudding hoofs of the horses that gallop across the screens. The life of the piano player in such amusement places is not a happy one. He must be able to project his artistic temperament from the solemn measures of Chopin's funeral march into the quickened crash of the well-known Mr. Alexander's ragtime band, or tear himself away from a tangled mass of "Silver Threads Among the Gold" to the long forgotten "Schooldays" as the film creatures are whirled through the scale of human passion from a writ of replevin for the sick child's bed to the reading of a will leaving the hero a million. While the world moves fast the films move faster, and music written for one thing must be cut off in early life so that another class of melody can pour forth.

All this makes it possible to appreciate the invention of a practical musical mechanic and moving-picture man, who has devised an electric piano that is provided with several rolls of music at the same time; and the operator can switch from one to the other at will. He can also return to his first love and begin just where he left off, if the action in the pictures require it. This he can do without changing his position. Heretofore it has been impossible to use electric instruments with any degree of success because of the trouble and delay in changing rolls when the character of the music had to be changed. The rolls made for the new instrument can be provided with several selections each and any one of them can be played without delay on the part of the operator. He can stop in the middle of one piece and by touching a button begin to play any of the others at any point he desires and then go back and finish the original. As stated, there is provision made for at least two rolls in each of these pianos and the same arrangements that permit the operator to go from any part of any piece on the same roll also permit him to stop playing one roll and go to the other without delay. Owners of moving-picture theaters regard the instrument as a great advance and a number of them have been installed in various parts of the country. The machine is equipped with both piano and organ mechanism and these can be played separately or together, at the will of the operator.

STRETCHER MAY BE BRIDGE OR LADDER

A stretcher for wounded soldiers, especially designed for use in mountain campaigns and capable of being easily changed into various forms useful for other purposes, has been invented recently by a French army surgeon.



Courtesy L'Illustration

Stretcher for Army Use in Mountain Campaigns

As shown in the illustration, the manner of carrying the stretcher in the mountains leaves the hands of the carriers free, which, of course, is a great convenience. The hammock-like litter is so suspended that its frame always remains horizontal and sideways upsetting is impossible. When desired, the stretcher can be converted into a bridge for the crossing of clefts in the rock, or a ladder to scale a steep wall of rock or ice.

The implement is constructed entirely of steel tubing, weighs from 25 to 30 lb., can be folded into a very small compass, and, in the form of a bridge or ladder, is strong enough to sustain the weight of two or three men.

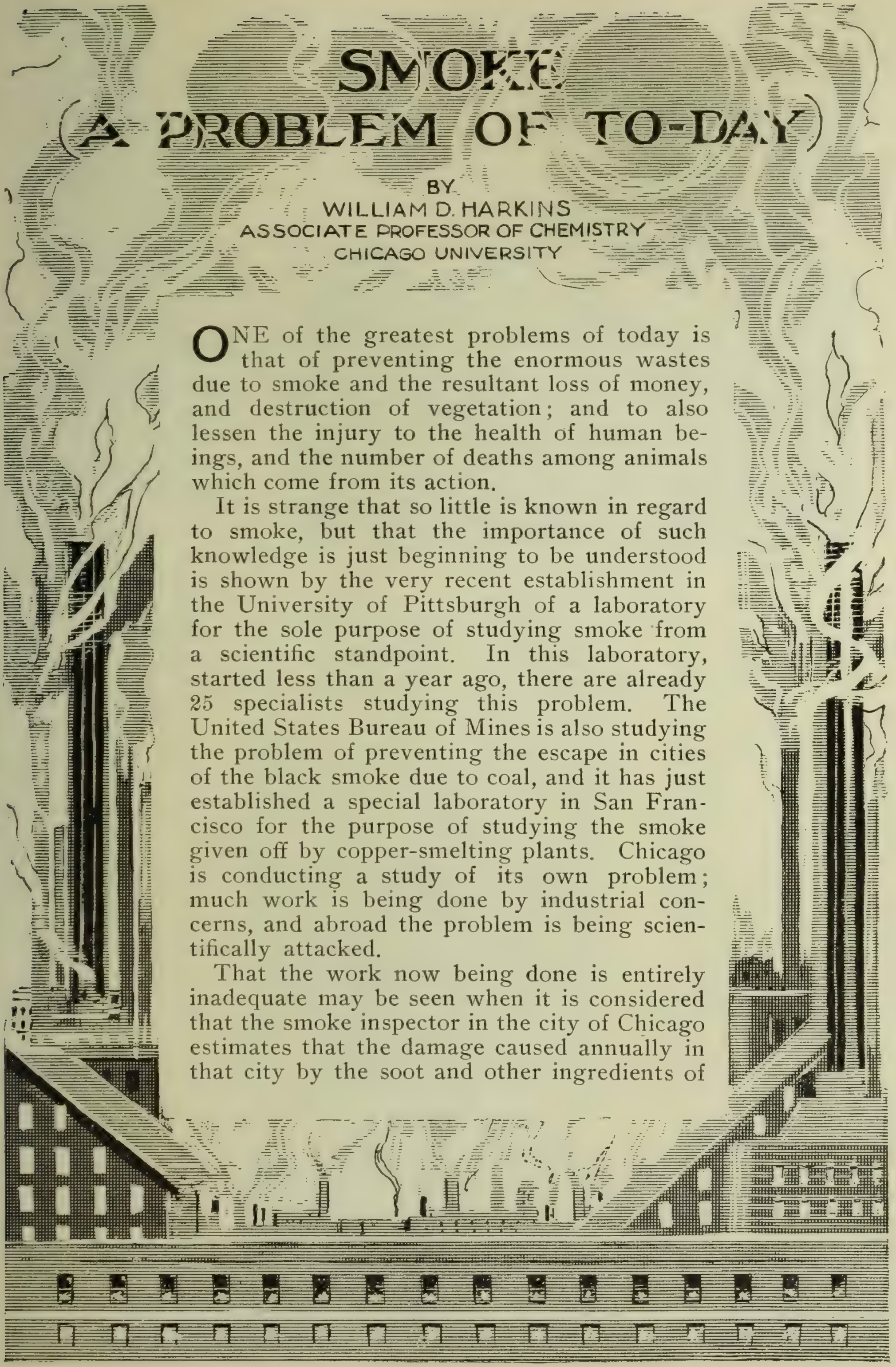
PEANUT OIL CAN DRIVE DIESEL ENGINE

Peanuts are excellent food for elephants, but that this nut should also provide an excellent food for the internal-combustion engine to operate on might seem an exaggeration, were it not for the fact that Doctor Diesel insists that his engine can use peanut oil almost as effectively as the cheap grades of natural mineral oil.

This engine can, in fact, use most any vegetable or animal oil for fuel, which, it is predicted, may promote industrial development in regions where the cost of mineral oil is prohibitive.

SMOKE
(A PROBLEM OF TO-DAY)

BY
WILLIAM D. HARKINS
ASSOCIATE PROFESSOR OF CHEMISTRY
CHICAGO UNIVERSITY



ONE of the greatest problems of today is that of preventing the enormous wastes due to smoke and the resultant loss of money, and destruction of vegetation; and to also lessen the injury to the health of human beings, and the number of deaths among animals which come from its action.

It is strange that so little is known in regard to smoke, but that the importance of such knowledge is just beginning to be understood is shown by the very recent establishment in the University of Pittsburgh of a laboratory for the sole purpose of studying smoke from a scientific standpoint. In this laboratory, started less than a year ago, there are already 25 specialists studying this problem. The United States Bureau of Mines is also studying the problem of preventing the escape in cities of the black smoke due to coal, and it has just established a special laboratory in San Francisco for the purpose of studying the smoke given off by copper-smelting plants. Chicago is conducting a study of its own problem; much work is being done by industrial concerns, and abroad the problem is being scientifically attacked.

That the work now being done is entirely inadequate may be seen when it is considered that the smoke inspector in the city of Chicago estimates that the damage caused annually in that city by the soot and other ingredients of

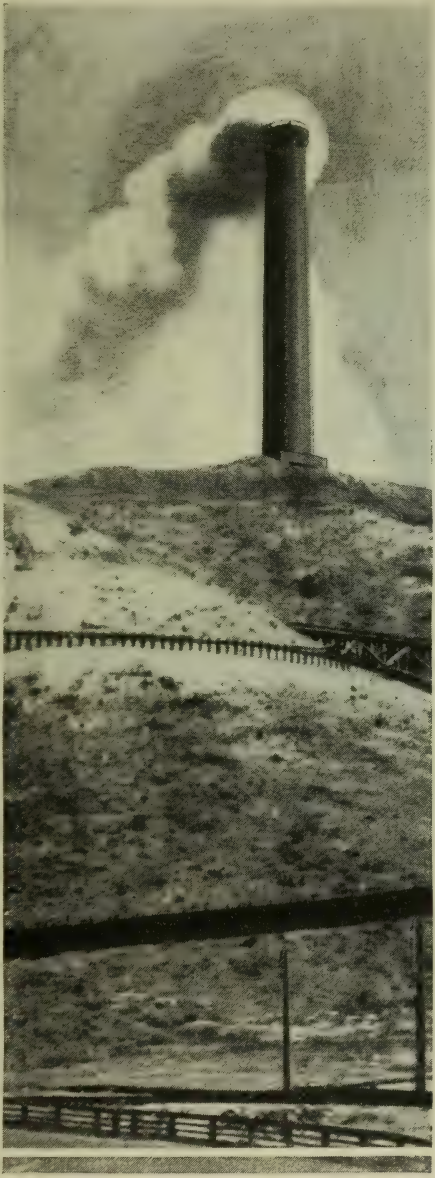
Great Chimney of Western Smelter Which was Found to Carry Out over 5,000,000 Lb. of Matter Per Day

smoke amounts to $50,000,000 in ruined merchandise, and on the same basis, it is said that the damage in the entire United States would be about $600,000,000 in one year. This, however, does not by any means represent the entire loss, since the black soot which escapes and does a large part of the damage, is really wasted coal, and it is estimated that the coal lost in the smoke amounts on the average to about 10 per cent of all that is used. In other words, the average purchaser of coal, when he pays five dollars a ton for it, tosses fifty cents worth out of the chimney unburned, to do damage to his neighbors, and then usually wastes a large proportion of the heat in the four-and-a-half-dollars worth that is left. When it is realized that the purchaser of this ton of coal is also paying for his share of the 300,000,000 tons of coal that are wasted in this country every year, some comprehension may be gained of the magnitude of wastes of this nature. However large these figures, the work of the government has shown that the losses are even greater than they would indicate, for by converting the coal into a gas called producer gas, not only is all the damage due to the soot of smoke eliminated, but in addition, by using the gas in a gas engine, a ton of coal gives two and a half times as much power as it would in a steam engine.

Tree Killed by Smoke from Distant Smelter

What is smoke? To most people smoke is just smoke, but to those who have studied it, smoke is much more complex and correspondingly more interesting. We may think of ordinary coal smoke as made up of two parts, the smoke that we see and the smoke that we cannot see, or the visible smoke, and the invisible. The visible smoke we call soot, and this is a very remarkable and a very injurious substance. About one-half of the soot is carbon, which is commonly known in the form of charcoal or graphite, or in a still purer state as the diamond. A form of carbon, which is much more like soot, is called lampblack, and this is used for making black paint. Those familiar with lampblack paints know that it takes very little of the paint to blacken a large surface, and this is also one of the properties of soot, the one which makes it so injurious to delicate fabrics and even to more ordinary clothing.

In addition to the carbon, soot contains about one-fifth of its weight of tar and oil, and these very sticky substances cause soot to have somewhat the properties of a paint, and make it much more difficult to remove the black substance from any kind of cloth. This tar and oil seem to be somewhat caustic in their action, and cause the soot to have an injurious effect on the leaves of plants, but much more injurious than this is the sulphuric acid, amounting to about one-twentieth of the weight of the soot. This acid eats up cloth, the leaves of trees, and even into stones or the steel rails of the railways. It may not eat holes in the cloth, but it weakens the fabric, and on leaves it often causes the formation of spots. Besides these substances soot contains a large number of ingredients of interest to a chemist, which are here put down in order to show its complexity. It contains ammonia, best known as a cleaning fluid; phosphate of lime, a constituent of bones; from one-tenth to one-fourth of its weight of sand; and small quantities of potash, soda, lime, magnesia, iron, phosphate of aluminum, chlorine, sulphocyanogen, carbonic acid, water, and traces of other substances.


Near View of Monster Smelter Chimney, Rising 1,100 Ft. above the Valley

The throwing out of visible smoke may be stopped by burning the coal in a proper way; or by converting it into gas, and then burning this gas; or by precipitating out the soot by electricity, according to the process invented by Doctor Cottrell of the Bureau of Mines.

The most injurious constituents of the invisible smoke are sulphur dioxide, sometimes called sulphurous acid, the odor of which is known to everyone who has lighted a sulphur match; and sulphuric acid. These substances are produced by the burning of the sulphur in the coal, and they have an injurious effect upon the trees, as may be seen

Smoke from Burning Oil in Texas Oil Fields—Though the Heaviness of This Smoke is Apparent to Solid Matter as Some Kinds of City Smoke Which have been Analyzed

in the neighborhood of South Chicago, in Pittsburgh, and near many railway tracks in cities. They are known in a much more concentrated form in the invisible part of smelter smoke, so that the damage to the trees around some copper smelters may be traced for a distance as great as 30 miles from the smelter, and the loss to the forests in the vicinity of the smelters of the west has amounted to many millions of dollars.

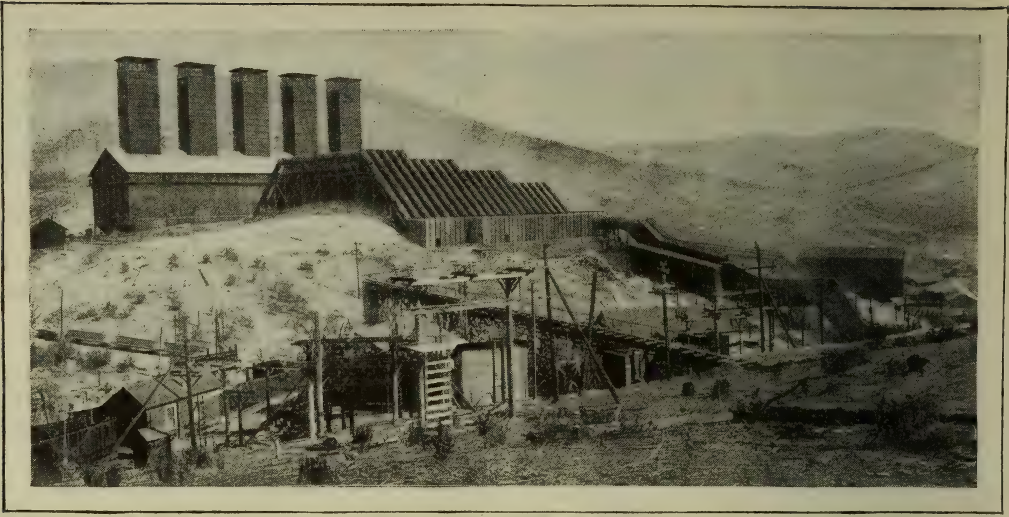
What would you think of the loss of a million dollars a year up one chimney? It is probable that there has never been a loss so great as this in exactly this way, but a western smelter has had a very interesting experience. A few years ago it was found that very large quantities of arsenic, copper, sulphuric acid, and other substances, were being thrown out by their four great smokestacks. The arsenic especially gave them considerable trouble, for the farmers, some of whom lived as far as 15 miles away, claimed that their cattle were being poisoned by the smoke and were dying, and that no one wished to buy the hay which was the principal crop of their farms, since it seemed to have bad effects on the cattle that ate it.

Anyone, It Actually Does not Contain as Much in Recent Studies

In order to remedy matters, the smelter company built one great smokestack, the top of which was 1,100 ft. above the valley below, in order to throw the smoke so high that the sulphur dioxide and sulphuric acid would not again come down to the surface of the earth, and it was supposed that the gases would do no more damage. The great stack and the flues which led to it are said to have cost nearly a million dollars. The great flues, which carried the smoke from the smelter up the mountain side to the foot of the stack, were built very large, in order that all of the solid part of the smoke, which contained copper and arsenic, might settle out before the smoke escaped. This great flue was 2,200 ft. long, the first 1,200 ft. being 60 ft. wide, and the remaining 1,000 ft., 120 ft. in width. The depth of the flue from its top to the bottom of the excavation, was 36 ft. That this flue was very effective in reducing the amount of copper lost is shown by the saving of about a half million dollars worth of copper per year by its use.

It would seem that such an effective flue as this would stop the losses, but an analysis of the smoke from the stack, made several years later, showed that even after this large amount of copper had settled out of the smoke, over 4,000 lb. of copper per day, at that time worth about one thousand dollars, still escaped from the top of the stack, and the wheels of mowing machines run in hay fields miles away, became rapidly coated with copper from the copper in the soil. This copper in the soil, however, had been collecting from the smoke for years.

The farmers still claimed that their horses and cows were being killed by the grass of their ranches. In order to determine if arsenic were still being thrown off in the smoke, analyses were made by Professor R. E. Swain, of Stanford University, and the writer. The average of these analyses gave the astounding result that 59,270 lb. of arsenic escaped from the stack in one day. According to the toxicologist Blythe, the smallest dose of arsenic trioxide which has killed a man is 2½ grains. If this amount would always prove fatal, the above result would indicate that the smelter gives off enough arsenic to kill each day more people than there are in the United States. Why should not all of the people in this valley be killed by such a great amount of arsenic? No deaths among human beings have been traced to the smoke, and it has not been proved that in any case even injury to the health has resulted. This is because human beings do not eat the grass or hay upon which the arsenic settles, and they get only the relatively small amount of



A California Smelter Method of Treating Smoke. The Smoke is Cooled through Long Pipes and Then Passes through Woolen Bags, 3,000 being Employed. From the Bags There is Taken Daily by Automatic Shakers about 25 Tons of Solid Matter

arsenic which they inhale with the air they breathe. The cows and horses, on the other hand, eat the grass upon which the arsenic may fall for months. The writer has gathered the leaves of trees near a smelter in Washington, which contained on them an amount of arsenic equal to over 4 per cent of the weight of the dried leaves, and grass gathered near by contained 1.3 per cent.

The analyses made on the smoke of the smelter first referred to showed that the volume of the smoke issuing from the top of the stack was 3,526,000,000 cu. ft. per day, and that this smoke contained 4,775 lb. of lead; 6,090 lb. of zinc; 4,320 lb. of antimony; 447,600 lb. of sulphuric acid, and 4,636,000 lb. of sulphur dioxide. If all of this sulphur dioxide were converted into sulphuric acid and sold at $10 per ton, which is less than the market price, it would yield over $20,000 per day. Here the difficulty is the cost of transportation, but the sulphuric acid might be used to convert the phosphate rock found not far from the smelter, into a valuable fertilizer.

The wastes of smoke are well illustrated by the fact that the soil near the abandoned stacks of the old smelter contained so much copper, gold, and silver, that the top soil of the hills was stripped off and smelted, and while there are no figures as to the amounts of these metals recovered it is known that their value was very great.

Of the two problems, that of getting rid of the visible smoke from coal, and that of preventing the escape of the injurious or valuable constituents of smelter smoke, the former is by far the more important, since it affects the lives of millions of people in the United States alone. A rich man can nowhere else get so large a return for his money in good to humanity as he can from money given to large universities in our great cities for scientific investigations in regard to the best means of preventing the great damage done by smoke to life and property. The establishment of the laboratory for this purpose in Pittsburgh is a step in the right direction, but the problem is one of so great a magnitude that similar laboratories should be established in all of our great cities.

¶In recent experiments in Germany, aluminum has been brought to a liquid condition capable of being spread when cold over any dry surface. The composition is applied with a brush, like paint, and is said to be a perfect substitute for tin in plating, being proof against atmospheric influences.

SANITARY TAXICABS FOR CHICAGO

Chicago is said to be the first city to use the new cleanable taxicab. The back and side cushions are mounted on framework instead of being attached to the body proper, the framework being slipped into keyways on the body. Thus the upholstering of the seats, back and both sides of the interior can be removed and cleaned in a few moments' time, keeping the cab clear of all filth and odor that might otherwise accumulate.

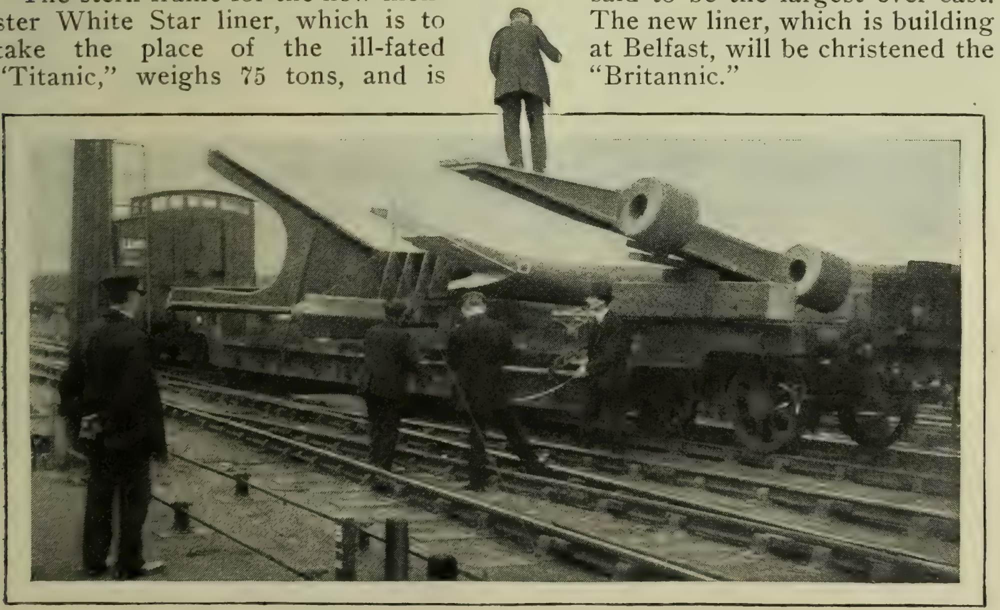
OXYGEN USED IN MAKING ALTITUDE RECORD

The French airman Legagneux, who broke the world's altitude record for aeroplanes by rising to a height of 17,881 ft., carried with him a tube of oxygen, which he began to use when he passed above 15,000 ft. The ascent took 45 min. 20 sec. Legagneux reached an altitude of 1,805 ft. higher than Garros, who rose to a height of 16,076 ft. 12 days before the former's record-breaking flight.

Legagneux, Holder of the World's Altitude Record with Oxygen Apparatus in Place

THE STERN FRAME OF THE "TITANIC'S" SUCCESSOR

The stern frame for the new monster White Star liner, which is to take the place of the ill-fated "Titanic," weighs 75 tons, and is said to be the largest ever cast. The new liner, which is building at Belfast, will be christened the "Britannic."

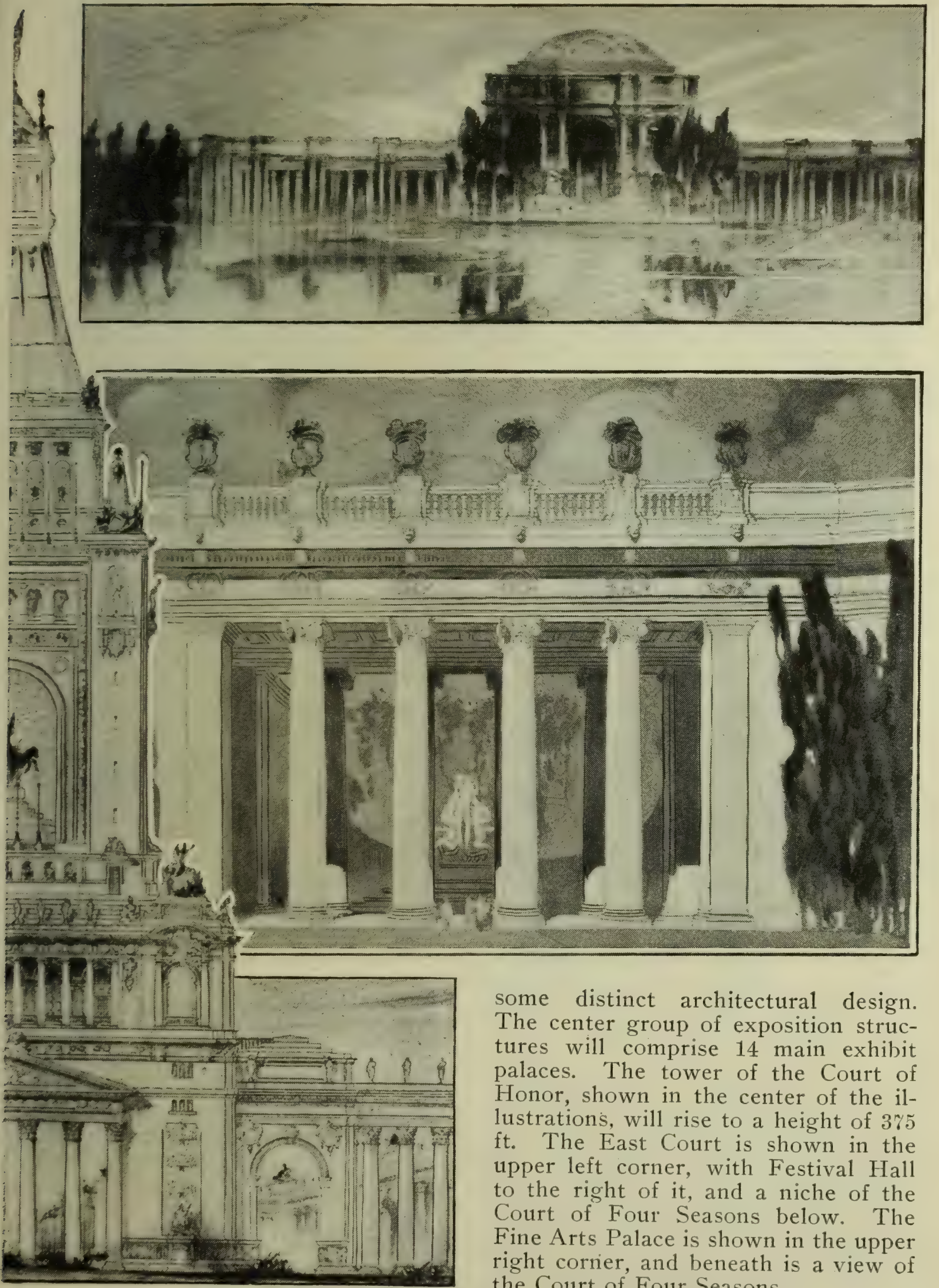


The 75-Ton Stern Piece for the "Britannic," the Successor of the Ill-Fated "Titanic"

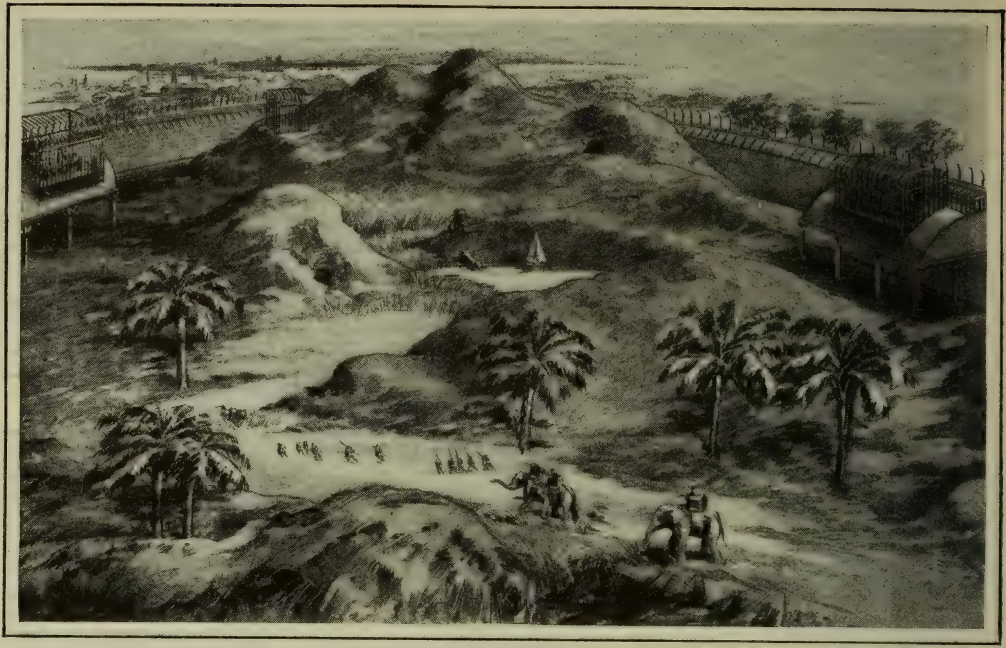
SOME OF THE FINE BUILDINGS DESIGNED

Final plans for the architecture of the Panama-Pacific Exposition at San Francisco, in 1915, have been definitely accepted, and all of the main exhibit buildings are expected to be completed before July, 1914, eight months before the exposition is to be opened to the public. The exhibit group of structures will be the loftiest exposition buildings ever constructed, and one of the architectural features will be the series of inner courts between the main exhibit palaces, each court expressing

FOR THE PANAMA-PACIFIC EXPOSITION



some distinct architectural design. The center group of exposition structures will comprise 14 main exhibit palaces. The tower of the Court of Honor, shown in the center of the illustrations, will rise to a height of 375 ft. The East Court is shown in the upper left corner, with Festival Hall to the right of it, and a niche of the Court of Four Seasons below. The Fine Arts Palace is shown in the upper right corner, and beneath is a view of the Court of Four Seasons.



How the Olympic Stadium in London would Look Converted into a Lion Hunt for Wealthy Sportsmen

REMARKABLE LION HUNT PROPOSED FOR LONDON

Much space was given recently in English illustrated journals and daily papers to Frank Bostock's remarkable scheme for providing London with an actual "lion hunt." The proposition was to organize a club, to convert the stadium in which the Olympic games of 1908 were played into an imitation patch of African lion country, and to stock it with lions, which members of the club could hunt to their hearts' content, while other members watched the sport from well-protected cages. The stadium, as it would appear so converted, is shown in the accompanying illustration. But few of the English newspapers took the proposition seriously, although considerable opposition was raised against the scheme at first, because of the erroneous report circulated to the effect that the hunting included the "shooting" of lions, whereas the capturing of them over and over again is all that was intended.

Much fun has been directed at the scheme. It is not unlikely, for instance, that the friends of a "brave hunter," seated in one of the cages, might call out to him: "Hey, Jim, he's right over there to the left."

Frank Bostock, lion tamer and exhibitor, who proposed the scheme, died at the time it was creating the most comment.

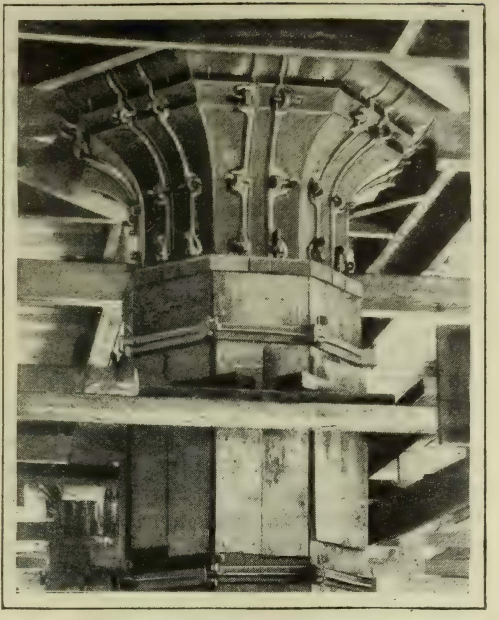
SAFETY LAMP CAUSES EYE DISEASE IN COAL MINES

While progress in science has enabled industrial concerns to greatly increase their output and has made the life of the worker much easier, at the same time it exacts its penalties and it has recently been discovered that the safety lamp used by the modern miner has greatly increased the prevalence of an eye trouble which seriously impairs the sight of the underground worker, especially coal miners. This trouble has been known for some time and is believed to be caused by the great eye strain to which the men are subjected when working in the dim light of the safety lamp. In mines where an open-flame light or candle can be used, the disease is rarely found. In Great Britain records show that some 1,618 miners were found to be suffering from the disease during one year, and the loss in money is estimated at more than $155,000, represented by the compensation paid these men under the law. This, of course, does not take into account the reduced earning capacity of the men during the progress of the disease to that point of acuteness which made them eligible to compensation under the law. This is one of the occupational diseases to which much study is now being given, though no real remedy has yet been found.

IRON MOLD FOR CONCRETE CAPITALS

In the construction of concrete columns and capitals for a new building in Dayton, Ohio, the contractors used an effective type of malleable-iron form for the latter. The columns, which are octagonal in shape, were poured in forms made of vertical planks. The malleable-iron forms for the capitals were mounted on top of the column forms, as shown in the illustration.

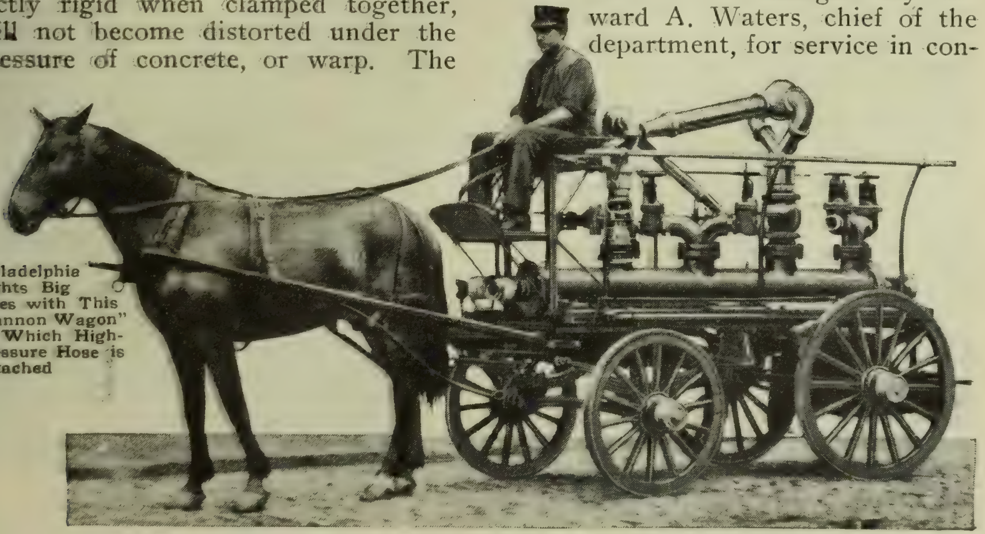
It is claimed that the malleable-iron form of this type is little, if at all, more expensive than wood, and, being perfectly rigid when clamped together, will not become distorted under the pressure of concrete, or warp. The forms can be adjusted to the various-sized capitals by the use of filler castings.



Malleable-Iron Forms for the Construction of Concrete Capitals

SHOOTING OUT FIRES

One of the most effective pieces of fire-fighting machinery possessed by Philadelphia is the "cannon wagon," shown in the accompanying illustration. It was designed by Edward A. Waters, chief of the department, for service in con-



Philadelphia Fights Big Fires with This "Cannon Wagon" to Which High-Pressure Hose is Attached nection with high-pressure mains at fires occurring in the business section of Philadelphia. The high-pressure hose is attached to the monitor, or turret nozzles with which the wagon is equipped, and the hose is manned by firemen specially trained for this work. In cases where the fire is accessible, the "cannon wagon" has been found quick and effective in extinguishing a blaze.

RADIUM PARTICLE SAVED FROM ASHES

An English firm of chemists, that hires out radium to physicians, went through an unusual operation recently in an attempt to recover a particle of this precious substance, the weight of which was about one-thirteenth of a grain, valued at about $500.

The radium particle, rented to a local doctor, was contained in a little holder known as the applicator, to which it was attached by strong varnish. After applying the radium to the body of a patient, the physician removed the applicator and the surgical dressing at the same time, and threw both into the grate fire. As the bandages flared up, the doctor realized his mistake, but it was too late to rescue the radium, as it had mingled with the cinders.

All the ashes in the fireplace were collected, placed in a cardboard box, and sent to the firm of chemists. The test applied showed the ashes to be radioactive and to contain nine-tenths of the radium originally contained in the applicator, and this was recovered.

LARGER SIEGE GUNS FOR U. S. ARMY

The old siege ordnance of the United States army, which consists of 5-in. field guns and 7-in. howitzers, is to be discarded for guns now being designed. The most important of these is a 7.6-in. howitzer which will fire a shell weighing 250 lb. This gun will be the minimum size of the siege ordnance.

A SPEAKING ELECTRIC LAMP

A surprising and to the layman even miraculous discovery was recently made by two German physicists. Accidental, as so many other new conquests of science, it opens up quite interesting possibilities, being nothing less than the transmission of sound through the medium of a tungsten lamp.

In the course of some experiments, the scientists had, for an entirely foreign purpose, connected a very sensitive microphone receiver in circuit with the lamp, together with other electrical apparatus that made the current serviceable for telephone purposes, and, to their surprise, what was whispered into the receiver could be distinctly heard when the ear was brought near the lamp. As the bulb of the lamp is a vacuum, it could not be ordinary sound waves produced through temperature variations and consequent vibrations in the filament, but the scientists attempt to explain the phenomenon by assuming that the

Cableway of a Pennsylvania

vibrations of the filament were transmitted to the thin glass walls of the bulb, and that these, in their turn, produced the sound waves perceived by the ear.

COAL DIRECT FROM MINE TO FURNACE

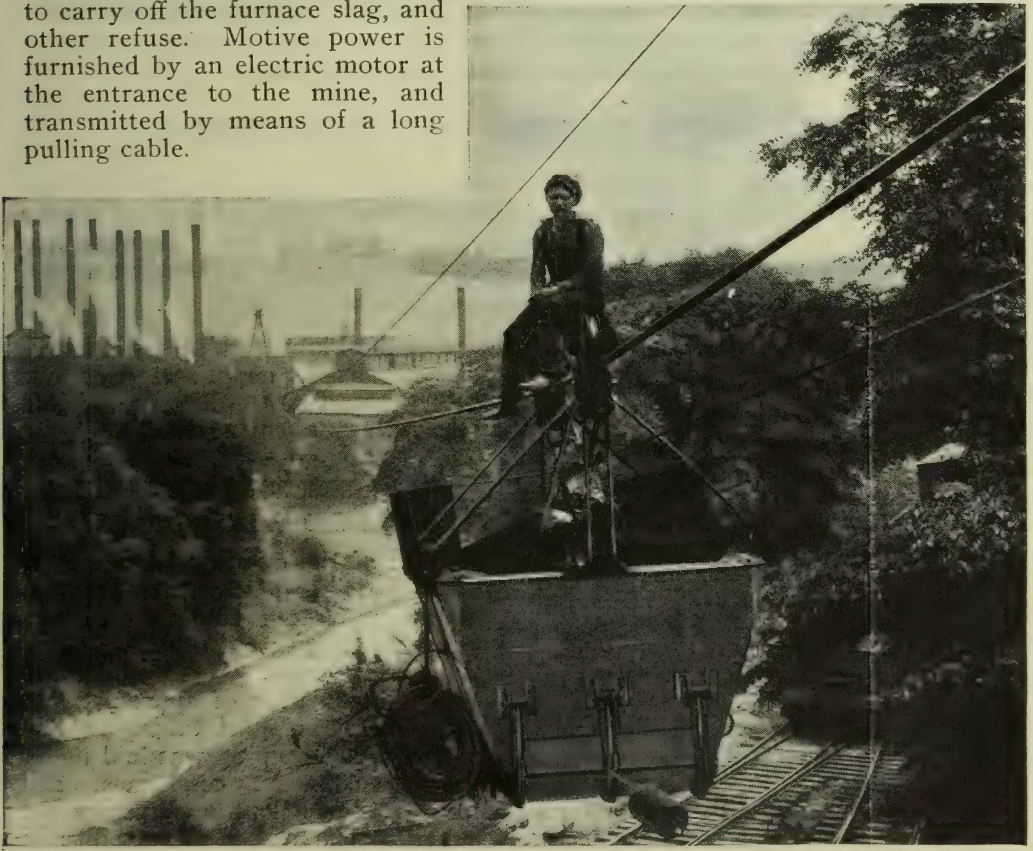
A large manufacturing plant located in the Pennsylvania coal fields employs a very novel and inexpensive method of bringing coal to its furnaces. The company owns a coal claim in an adjacent hill to which a heavy aerial cable is strung.

A car, shown in the illustration, is suspended from the cable on two double-flanged wheels and is used to carry coal direct from the mine to the coal bins in the boiler rooms of the plant. The car is also utilized to carry off the furnace slag, and other refuse. Motive power is furnished by an electric motor at the entrance to the mine, and transmitted by means of a long pulling cable.

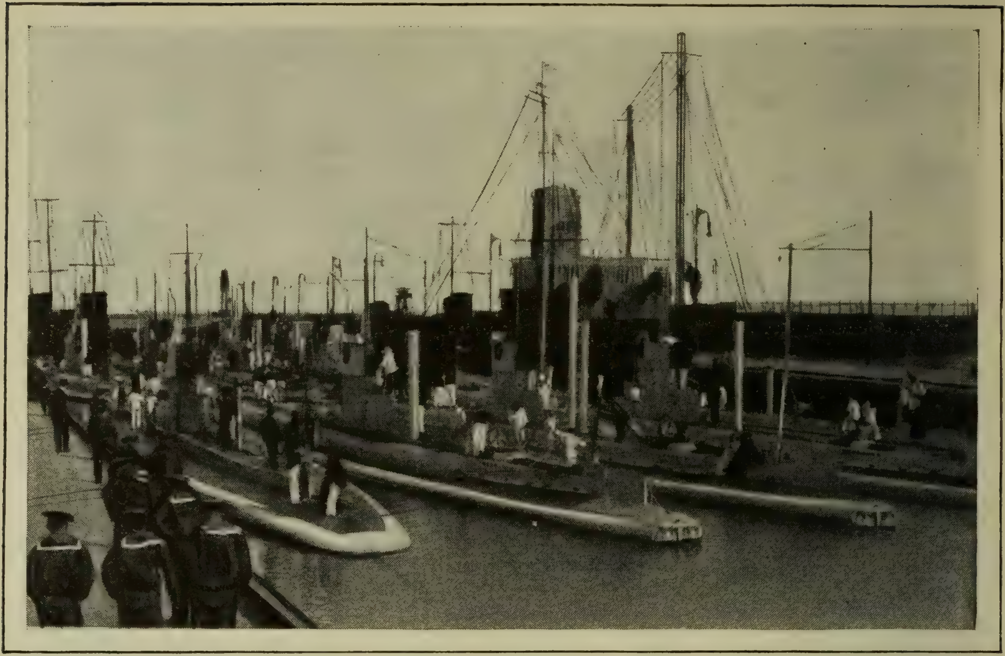
LIVERPOOL MAY HAVE SUSPENSION BRIDGE

It is proposed to erect a suspension bridge of the type spanning the East River, New York, across the River Mersey, Eng., to connect Liverpool with Birkenhead. The proposed bridge would have a central span of about 2,000 ft., two end spans of about 1,000 ft., and would be 60 ft. wide, with a clearance of 150 ft. from the surface of the water at high tide to the under side of the roadway. The extreme distance between the approaches would be two miles. Provision would be made for elevators at convenient places at each side of the river to raise the dockside traffic to the bridge.

The cost of the structure is estimated at $14,500,000.



Manufacturing Plant Carries Coal Direct from Its Own Mine on the Hillside to Its Furnaces



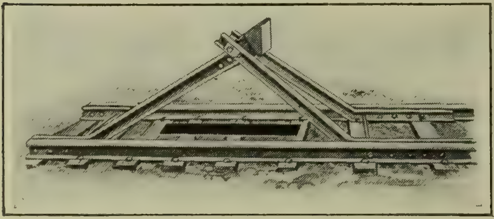
A Fleet of German Submarines Ready for the Naval Maneuvers

GERMANY'S UNDER-SEA FIGHTERS

A fleet of German submarines in dock are shown in the accompanying illustration. These little under-sea fighters played a prominent part in the naval maneuvers in the North Sea. While they were navigating under water, two of the huge Zeppelin airships navigated the air overhead.

ALL-STEEL BUMPING POSTS

A railway bumping post of interesting design is shown in the accompanying illustration. These posts are complete within themselves, requiring no concrete or earthwork foundations or reinforcement, and can be moved from one location to another if desired. The force of the blow is taken by a heavy cast-steel head, supported by four pieces of steel rail, which are bolted direct to the railway tracks.



A New Type of Bumping Post

HIGH-PRESSURE GAS PIPES WELDED WITH TORCH

By use of the oxyacetylene torch it is now possible to lay high-pressure gas mains without couplings of any kind, one length of tubing being welded to the next. This was done in a recent installation of approximately 5,000 ft. of 8-in. steel tubing in San Francisco. The piping was laid under the most difficult conditions, and afforded an excellent opportunity for a practical test of the adaptability of oxyacetylene welding to high-pressure gas mains.

COMMENT AND REVIEW

Panama Canal Rates

THE question of whether our own merchant marine engaged in coastwise traffic shall or shall not pay canal tolls, which has occasioned so much comment on the other side, turns out to be a very simple matter after all. There can be no discrimination against vessels of other nations, because vessels of other nations are not allowed to engage in our coastwise traffic. This prohibition has been in force for many years, and antedates the construction of the canal. To impose tolls on our own ships carrying our own freight from one part of our own country to another part is simply to tax ourselves, for the consumer — ourselves — must ultimately pay the freight, or tax, in the increased cost of the article carried. We are already paying a tax in interest on canal bonds, and will continue to pay for many years to come, for it was not expected the canal earnings would pay operating expenses and interest on its cost for some years at least.

* * *

Our National Sin

WE are continually reminded of the need of conservation of our natural resources—forests, mines, water powers and the like—and action in this direction is highly desirable, if not even now absolutely necessary. Given sufficient time, the forests may be increased, the water powers extended from a few months to the entire year, and dying soils revived. But there is a yet more important waste that is nation-wide, and is found where there are neither forests, nor mines, nor water powers. It exists in every state and is growing all the time, not only by reason of larger population, but at an increasing percentage as well.

This is the waste in the home kitchen.

As a nation we have practiced extravagance from childhood; really a natural and logical sequence in a land of apparently inexhaustible resources, where valuable hardwood trees were burned to clear the land for cultivation, which same land later produced so bountifully that corn was often used as fuel because it was too cheap to sell. Those days have passed, it is true—never to return again in the United States. But the condition named was only one of many, incident to the growth of this country; and however justifiable such wastes may have been in their day, and while not practiced at the present time, they nevertheless contributed to the growth of a spirit of reckless wastefulness which has now pervaded all classes. Even the most thrifty immigrants, born and reared to exercise the most extreme economies, soon lose much of it after a few years in America, which throws away every day in the year enough food alone to feed, and feed much better than some are now fed, a nation of 15,000,000 souls; as, for instance, the combined population of European Turkey and Persia, or all of Manchuria. Perhaps we will comprehend it better in terms of our own cities; that is, enough is wasted through carelessness or ignorance in preparation, or thrown away after cooking, to actually feed—though perhaps not quite as well as they are fed, but to sufficiently feed—the combined population of the following cities: New York, Chicago, Philadelphia, Cincinnati, St. Louis, San Francisco, New Orleans, Los Angeles, Omaha, Denver, Portland, Ore., St. Paul, Minneapolis, Detroit, Milwaukee, Cleveland, Buffalo and Kansas City, Mo. Seems impossible, but the figures are under rather than overestimated.

Just think of it; enough nourishing food absolutely wasted in this country every day to feed every man, woman and child in 18 of its largest cities! Part of this loss is due to ignorance and carelessness of servants, but a very large portion is waste for which the housewife is responsible. At only 10 cents per meal the above loss amounts to $4,500,000 per day, or $1,642,500,000 per year.

The only wonder is the "high cost of living" is so low.

* * *

Fire-Prevention Day

FIRE-Prevention Day, while not yet dignified as a public holiday, is steadily making progress in the scope of its influence. The idea originated in Chicago and the anniversary of its great fire was logically chosen as the date. On this day special attention is called to fire prevention and fire waste, and a general cleaning up of factories, warehouses, stores and homes is urged in public press and by circulars and posters. There is now a National Fire Prevention Association, which this year presents the familiar figures in a new way. The average per capita loss in six European countries is 33 cents; in the United States, $3. A family of five, whether rich or poor, thus pay an annual fire tax of $15, because the loss is figured in as part of the cost of production, and the consumer finally pays in articles purchased. Chicago has a fire loss of $5,000,000 every year, while Berlin, same size, has only $175,000 per year. The Chicago fire department costs $3,000,000 annually, while Berlin spends only $300,000. We think the fire insurance companies pay the loss; they don't; you and I and all the rest pay; the insurance company merely collects and disburses the money. Here a house burns up and all the neighbors join in sympathy and help. Over in Europe, where they have the fire business down to a fine point, the neighbors are indignant if your house gets afire, and soundly resent the danger you have, however unintentionally, brought to them. To get afire there is on a par with getting the smallpox, and is a very unpopular thing to do. In addition, the owner of the premises has to pay a good, round sum for the use of the fire department, even if it does no more than come to the place. In some cities the luxury of having one's chimney burn out costs $25, and other forms of fire indulgence in proportion. The result is, people are careful themselves, and watchful of their houses and their servants.

For ten years past our national fire loss has been $30,000 an hour, night and day; $250,000,000 a year, or $2,500,000,000 in 10 years.

At $10,000 per mile, this two and a half billion dollars would have built 250,000 miles of good roads; about 5,000 miles for each state. It's another instance of our national, inborn recklessness of value; the outgrowth of the same careless, thoughtless spirit which wastes 45,000,000 meals a day referred to in "Our National Sin." As a nation we are frisky, coltish and regardless in these things; but it does seem as though we had sown about enough of these wild oats, and should begin to exercise some of the wisdom of adult nationhood.

This business of being fined for your house getting on fire would be a very unpopular piece of legislation, just as a fine for throwing too many tin cans in the alley is unpleasant, but that is just the beauty of the scheme.

The average man would writhe more at paying $50 for service of the fire department which put out his fire than over the $500 loss on what burned up. But one thing is certain, he would not be called on to pay a second similar fine for a long time. Our present system seems all wrong. Here in Chicago, for instance, we are taxed $3,000,000 per year to put out the other fellow's fire—and incidentally to save our own property from contagion—whereas, the fellow who through carelessness had the fire which endangered the rest of us is the one who should foot the most of the bill.

* * *

More Fire Drills

HAVING thus so nicely disposed of the Fire Loss, which presumably will be greatly reduced after publication of the above comment, we come to the question of fire drill in factories and large offices. The public schools have demonstrated repeatedly the value of the training which is now given in most cities, but in thousands of manufacturing plants, little or no attention is paid to the matter. Under compulsion from the insurance companies, emergency equipment for putting out incipient fires is provided and maintained in a condition of more or less utility—quite frequently less—but, as a rule, the vastly more valuable human lives are left to shift for themselves. The drill is most important in those places where women and girls are employed, but necessary wherever large numbers are employed. One Chicago concern employing 1,800, chiefly young women, empties its building in three minutes. The building is supposed to be fireproof, but nevertheless the drill is practiced regularly. However, municipal authorities state it is in the smaller plants where fire drill is neglected and greatly needed. Small plants are usually more poorly equipped in such matters and there is a corresponding lack of discipline in carrying on the work. Some cities are adding a fire-protection bureau to their administration, and supervision of fire drill would be assumed by this department. Fire drill should be made compulsory in places where people in any considerable numbers work, just as it already is generally compulsory in public schools. After the first drill—which is usually treated by the employes as a farce—there comes a spirit of appreciation and coöperation, and finally a genuine pride in doing the thing well, just as on board ship the boat drill is perhaps the most interesting feature of the voyage.

* * *

Convict-Built Roads

MASSACHUSETTS is justly proud of its state roads, which are a revelation to visitors from other states; other New England states have some, and New York is coming into line. These roads have cost millions of dollars. Then we travel westward across 1,500 miles of thickly settled country with very few all-the-year-good roads until we reach Colorado, where the good-roads problem is being demonstrated in a way which must sooner or later command the attention of all the other states. There 1,000 miles of highway, ranking with the best in the world, have already been constructed entirely with state-convict labor. And these good roads have cost 14 cents, which otherwise would have cost $1. In other words, the money which ordinarily would have built one mile has, under the Colorado system, built seven miles.

It was my privilege last month to listen to Thomas B. Tynan, warden of the Colorado penitentiary, who occasionally finds time to leave home and tell the intensely interesting story of how he has solved the question, not only of what to do with convicts, but how to reform them at the same time. He tells part of the story in moving pictures, showing his men in citizen's clothes, busily at work drilling, blasting, plowing, hauling and surfacing; in many cases, out in the mountains, in sparsely settled districts, with every facility imaginable for escape. But one looks in vain for the customary guards with long-range rifle at command. No guards, no shackles, no distinctive garb, absolutely nothing to distinguish the convicts from their foreman, except that the foreman rides a horse. These men work in large bodies, often several hundred; only one barrier stands between them and escape; and it is impossible for the moving picture to show that barrier, for it is a Man's Honor. In fact, the honor system was partly a result of the discovery that, to efficiently guard the prisoners, the expense was equal to the saving effected by their work, and hence of no financial advantage. And so the honor system was proposed amid plenty of predictions of failure and very few of success.

Now, as Warden Tynan remarks, the Colorado convict is no saint, and about 25 per cent of them are dangerous and should be confined. Of the 75 per cent some really should not be where they are, and all can be trained to better citizenship for return to freedom, by treating them as men. In accordance with this theory, which has been confirmed in practice, the men who are allowed to go out on the work are treated, housed and directed in their work like any well-arranged railroad camp outfit. They construct their own temporary living quarters, but there are no bolts on the doors nor bars on the windows. True, they all retire to bed and arise at one time, but so do soldiers. The men are worked in rural districts; they do not go to town, and unless a man breaks a rule he need never return to the prison. He can serve his full term in the open air, and when his time expires he has become proficient in something—surveying, blacksmithing, farming or other occupations for which there is a demand. Not only that, but by earnest, faithful work of eight hours daily and observance of the rules he can reduce a five-year term one half.

During the past two years only one man in 200 has run away; he is invariably recaptured and must then serve 10 years within the prison walls. Colorado is about to put all its county jails under the penitentiary board, when the jail prisoners will be worked in the same way. The spirit of the Colorado system is "unconscious reform," growing out of the feeling that some one has confidence in him. The good roads they build and the farms they work for their own support are a part of the means to the greater object.

Every year, in the United States, 150,000 men are added to the prison roll. Of these about 112,500 are capable of reform under the Colorado plan. But from the mere standpoint of wasted production this vast army should be employed.

The results are tremendous, for 100,000 men represent 30,000,000 days' work a year. If Warden Tynan could only tell his simple story and show his pictures in every city and town in the land, in 100 years we should have 1,000,000 miles of good roads.

H. H. WINDSOR

Must America Trail Europe in Aviation?

By MAJOR SAMUEL REBER

Chief Signal Officer, Eastern Division, U. S. Army, Chairman of the Contest Committee, Aero Club of America

[For an answer of constructive criticism to the above question, the Editor naturally turned to Major Reber because of his commanding position in the technical, military and sporting development of aviation in America, and because his only motive in the science is to encourage the best results from the best men using the best material.]

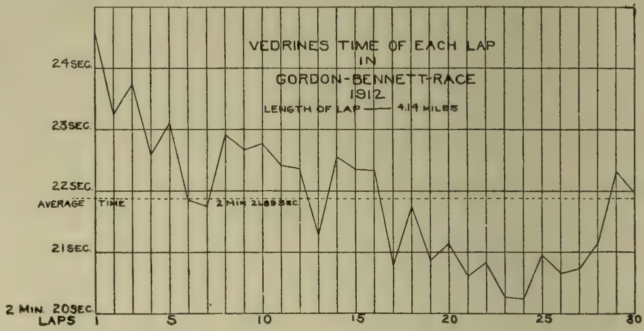
THE result of the last contest for the Gordon-Bennett Aviation Trophy, at Clearing, Illinois, September 9, was undoubtedly a great surprise to all Americans who have not followed closely the development of aviation in this country. Up to the close of the starting time on that day the public at large had somehow a confident feeling that the American sporting spirit had provided the means and that American engineering skill had produced a defender with which an American pilot could keep the cup safely anchored in our country. France, the only challenging nation that sent her machines and pilots to wrest from us the world's most coveted trophy, won so easily and proved her supremacy in the air in such a decided manner as to incline one to take liberties with Bret Harte's well-known lines and ask, with some reason,

Is American aviation a failure,
And has the airman's race played out?

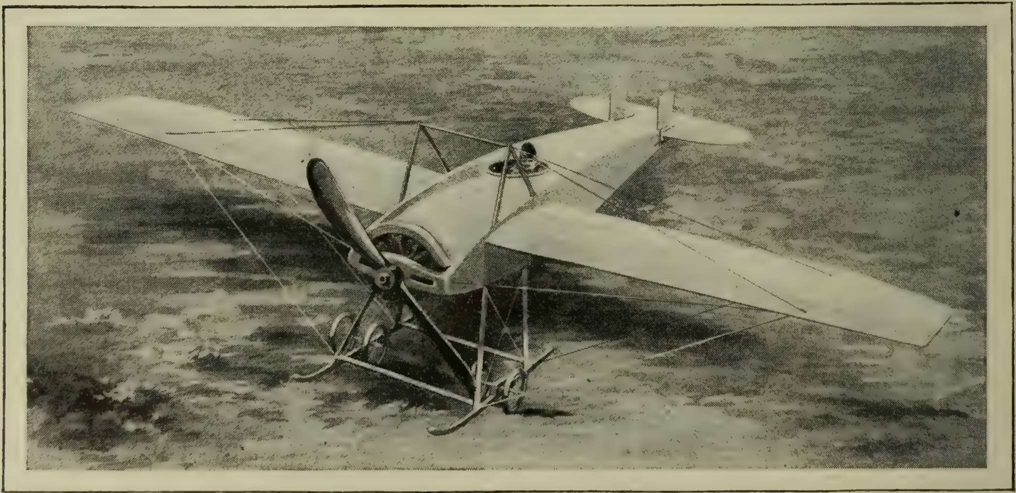
> *"America, which gave birth to the art of aviation and which led the world during the period of its early development, has been distanced by the great nations of Europe and, with the exception of the hydro-aeroplane, has contributed practically nothing to the advancement of the science or the art in the past three years."*

The results of this race mark the advance in aviation from year to year; the machine and motor winning the trophy are universally accepted as representing the highest development in the art from a mechanical and engineering point of view, and the successful pilot is hailed as king of the air for the year. When the winning machine, motor, and pilot are all of the same nationality, the supremacy of the air is yielded without hesitation or dissent to the country producing the winning trinity. In this yearly blue-ribbon event in aviation, which since its initiation in 1909 has been over a closed circuit, the distance has increased from 12.4 to 124.2 miles and the average speed of the winning machine from 46.9 to 105.1 miles per hour. An American pilot, Glenn H. Curtiss, with a biplane and engine of his own design won the first race at Reims in France The second race was won by an English pilot, Claude Grahame-White, with a Blériot monoplane and a Gnome engine at Belmont Park in this country. America is credited with the third victory at Eastchurch because the parents of the winning pilot, Weymann, who drove a Nieuport monoplane equipped with a Gnome engine, were American citizens—a rather barren victory for America from an aviation standpoint. The last race was won by a French pilot, Védrines, in a Deperdussin monoplane equipped with a Gnome engine. France, who for the two preceding years had supplied the winning machine and motor, finally succeeded in completing the winning trinity, at Clearing, Illinois, where the best that America could do was, within the last three minutes before the close of the starting time, to send up an old-type Wright machine with an old-type Wright engine which flew for less than 15 minutes and seemed like an old mother bird hovering over her progeny glorying in their achievement. The performance of the French trinity, the pilot, the plane, and the engine, was truly remarkable, as will be seen from the diagram showing the time of each lap, 4.14 miles in length, Védrines' average speed being 105.1 miles per hour. The speed at which he made his fastest lap was 106.3 miles per hour and that at which he made his slowest was 103.2 miles per hour. The wonderful skill of the pilot is evidenced by the fact that the maximum percentage-variation in speed made in any lap from his average speed was 1.8 per cent, or in other words, a speed regulation obtained only in the highest types of automatic machinery, truly remarkable indeed, when one considers the physical strain of driving, for over 70 minutes, a machine traveling at an average rate of 105 miles per hour.

America which gave birth to the art of aviation and which led the world during the period of its early development has been distanced by the great nations of Europe and, with the exception of the hydroaeroplane, has contributed practically nothing to the advancement of the science or the art in the past three years. When our aeroplanes are compared with those of the French, for example, the advantage is immeasurably on their side so far as the correct applications of engineering principles, design, ruggedness and strength of landing gear, control, exquisite perfection of details and finish are concerned. Their motors have a much better performance record than any made in America.

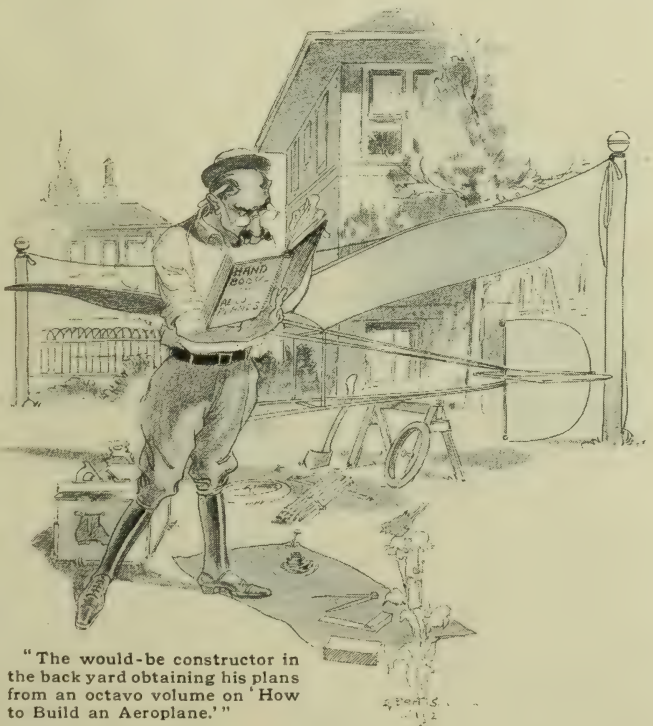


At the close of the year 1908, Wilbur Wright held all the important world's records in aviation, none of which has been subsequently held by an American pilot or machine at the close of any succeeding year. Through the genius of the Wrights, America led the world at the beginning of 1909, but has retrograded since that time until it is now far behind France, Germany, England, and Italy, not only in the number of pilots, types of aeroplanes and engines, but also in engineering skill and construction. The year 1909 was memorable for the great improvement in the skill of the pilots as shown in the increased distance, duration, and height of their flights; the beginning of cross-country flying and the first crossing of the English Channel, a feat that today attracts no par-



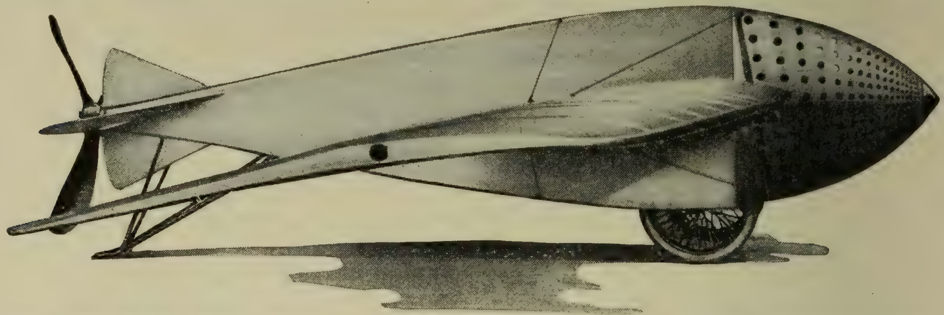
The Cup Defender Built by a Syndicate to Represent America, But Which did Not Fly in the Race ticular attention. 1910 is notable for the exploitation of aviation from a promoting and sporting point of view as evidenced by the large number of aviation meets held throughout the world. The year 1911 saw the appearance of a practical hydro-aeroplane; the development of cross-country flying in the long-distance circuits of Europe, and the addition of the aeroplane to the war material and the military airman to the personnel of the armies of the great military powers. This year has been marked by the great advances made abroad in engineering and construction and by the successful employment of the aeroplane in actual war.

A wave of enthusiasm, caused by the reports of the performances of the pioneer pilots, spread over the country in 1910 and led our people to throng to the meets and exhibitions in various parts of the land. The first meet, held at Los Angeles, in January, was a success both from a sporting and financial point of view, and it seemed after this meet that the new art would find its principal support as a sport. Subsequent meets, while highly satisfactory from the point of view of the performance of the machines and pilots, were not successful financially. The most important meets held in this country, one at Belmont Park in 1910 and two in Chicago, one in 1911 and the other last September, were organized for the purpose of advancing public interest in aviation in this country. The support that the organizers received from the public at large will not, I am afraid, induce public-spirited citizens to venture again in this field. The exhibition field has likewise proven as barren. Most of the exhibition companies that have toured the country have been forced out of existence from want of financial success; those in existence have difficulty in making their expenses, while the competition of individual airmen for contracts for appearance at country fairs has rendered the making of a mere living extremely difficult for the fraternity. The public is no longer satisfied with safe and sane flying, but demands spiral glides, dips of death, etc., which have in the past, and will in the future, greatly increase the number of unnecessary fatalities. A serious effort was made this spring to organize an 1800-mile circuit in the middle west for the purpose of developing cross-country flying, a most important branch of aviation of which nearly all our pilots have no knowledge; and in only one of the ten large cities, Chicago, was the necessary support secured. In fact, it seems that the American public is not sufficiently interested in aviation to give it the finan-

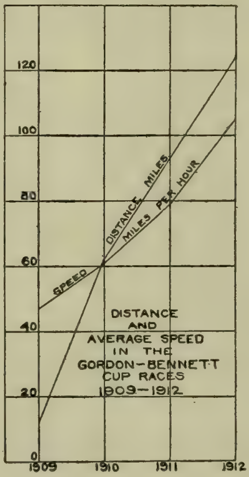


"The would-be constructor in the back yard obtaining his plans from an octavo volume on 'How to Build an Aeroplane.'"

cial support necessary to establish it as a recognized sport.



The Gallaudet Monoplane "Bullet," Which, It was Hoped, would have Competed in the Great Race



In 1907, the Signal Corps of the army, realizing the value of aviation as an adjunct to the military art, issued specifications covering the construction of aeroplanes for military purposes and received over twenty tenders for machines. But one firm of constructors, the Wrights, delivered a machine in 1908, which during the acceptance trials fell, killing Lieutenant Selfridge and badly injuring Orville Wright. As a result of this accident, the trials were postponed until the following summer when the machine, having successfully passed the required test, was accepted and two pilots were trained by the Wrights. Since that time, progress in military aviation could not be made as Congress did not appropriate funds for this purpose until 1911, when the sum of $125,000 was made available. This year, Congress has authorized an expenditure of $100,000. In 1911, a school for the training of military airmen was established at College Park, Maryland, where there are at present nine officers on duty and four machines available. Before an officer is rated as a military airman he is required to pass certain tests to demonstrate his skill. Five officers only have passed the required test and two of these are no longer on aviation duty. During the August maneuvers in Connecticut, there were but three aeroplanes available for reconnoissance work, none of which could carry an observer in addition to the pilot (an essential requisite for efficient results), and two of them could not be used when most needed on account of engine trouble due to defective design. Fortunately, the skill of the pilots offset the defects of the machines and their reconnoissance work proved the great value of the aeroplane as an essential part of the equipment of an army. Congress has not appreciated the importance of or given adequate support to military aviation. On the other hand, the great nations of Europe have realized its importance, and France has led the world in its utilization. Aviation has appealed more strongly to the imagination and esprit of the French people than to the rest of the world. This nation, seeing an opportunity of increasing its military strength over that of its neighbors, who have not been so prompt to appreciate the utility of aviation, raised large sums of money by popular subscription for the purchase of aviation material for the army, and public opinion has forced the government to support and develop the fourth arm of the French army. The French and English governments have for the past two years given direct support and encouragement to manufacturers by money awards at military trials and subsequent orders for the machines winning in the trials. The importance that the nations of Europe have attached to military aviation may be judged from the following table:

Country	Aeroplanes			Pilots			Appropriation
	Army	Navy	Total	Army	Navy	Total	
France	259	1	260	161	10	171	$7,492,000
Russia	99	1	100	23	5	28	not specified
Germany	46	2	48	50	2	52	$1,000,000
England	23	6	29	57	31	88	$1,540,000
Italy	22	4	26	31	4	35	$2,000,000
Japan	10	4	14	4	4	8	not specified
United States	4	2	6	10	4	14	$100,000
China	1	—	1	1	—	1	not specified

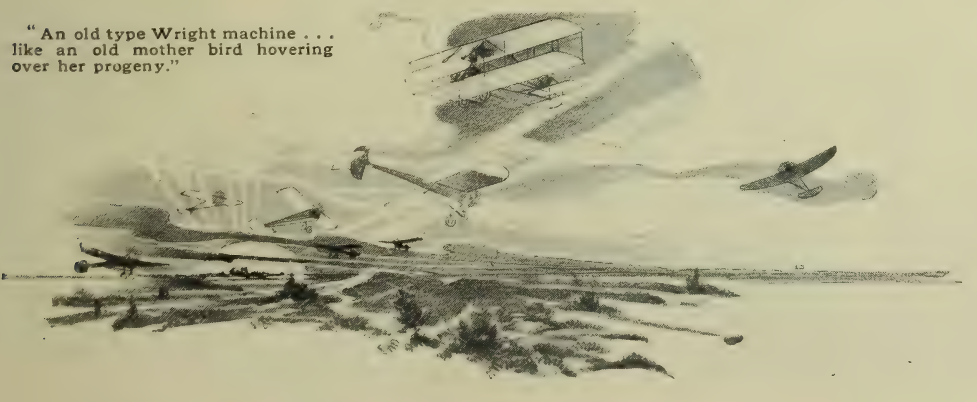
Experience, experiment and application of engineering principles have advanced the construction of the aeroplane far beyond the pioneer machines of our chief inventors. Judging, however, from the large number of freak machines that are to be seen in the hangars around our aerodromes, there is no general realization that the correct design of an aeroplane calls for a new branch of engineering—aeronautical engineering—which embraces physics, mechanical engineering, meteorology and even marine engineering and naval architecture. It is to be hoped that the day will soon come when the carpenter shop or the back yard will no longer serve as a factory nor the would-be constructor obtain his plans from an octavo volume on "How to Build an Aeroplane," or from the pages of an aeronautical journal. The number of imitators of successful designs is great, but the really competent designer is a "rara avis" in this country.

What American Aviation Needs:

Support by the public
Support by the government
Federal control of flying
Endowed aeronautical laboratories
Aeronautical engineering courses in technical colleges
Scientific construction methods
Improved motors

Whatever may be the cause, no motor of American make has remained in the air half as long as the best of foreign production. To place the development of mechanical flight on a correct engineering basis, the cut-and-try methods of the pioneers must give way to both theoretical and practical investigations of the laws of aerodynamics, and the correct principles of design, and to careful tests of machines and the materials entering into their construction. This can be done only in suitably equipped aeronautical laboratories by a trained staff. Unfortunately, there is no such laboratory in this country and America is compelled to await the results obtained in the foreign privately established and endowed laboratories, as the foreign governmental institutions do not, as a matter of military policy, make public any results.

Outside of the nominal control of licensed pilots in sporting events by the Aero Club of America, as the representative of the International Aeronautical Federation, and the restrictions contained in the laws of Connecticut, there are no prescribed governmental tests to ascertain the skill of airmen, no inspection of machines to develop their defects; no inhibition against



"An old type Wright machine . . . like an old mother bird hovering over her progeny."

carrying passengers or flying over cities; no rules of the road in the air. Under the present conditions in this country, any person, no matter how inexperienced, may fly any machine, no matter how unsafe, without incurring any legal penalty, and, moreover, can carry as a passenger any person rash enough to accompany him. On the other hand, in a number of states an attempt at suicide is a crime.

The federal government has prescribed regulations looking to safe transit on land and over water, but has neglected transit in the air. The press at large has not given aviation any real support. With the exception of a few broad-minded and progressive journals, it has devoted its columns to the exploitation of its spectacular side and to descriptions, with grewsome details, of the unfortunately frequent casualties, creating the impression that aviation is unsafe, unnecessary and of no practical utility. The public has lost interest and does not support aviation as a sport; the government has given but little aid in developing it as an adjunct to the national defense, and has imposed no regulation or restriction on its private use; the output of aeroplanes and motors in this country is inferior both in number and quality to that of the foreigners; our airmen are fewer in number and of less experience; no public-spirited citizen has endowed an aeronautical laboratory as has been done in many instances abroad; our technical colleges have not afforded opportunities for the scientific training of aeronautical engineers.

Such is the present status of American aviation.

Its needs are evident and will be satisfied when the public at large and the government give the same measure of support to it as is given abroad; when the qualifications of airmen and machines, and their circulation in the air, are controlled by federal regulations; when aeronautical laboratories are established and technical colleges turn out men as accomplished in aeronautical as in other branches of engineering; when our constructors improve their methods, and our mechanical engineers their motors. The successful solution of the problem of dynamic flight was due to America. In view of what she has done in other lines of endeavor, America, having once led the world in this new art whose possibilities and potentialities the future alone can portray, can confidently be expected to regain her lost supremacy of the air, but cannot accomplish this without the earnest cooperation of all, in official and private life, who are interested in the welfare of this newly born handmaiden of civilization, aviation.

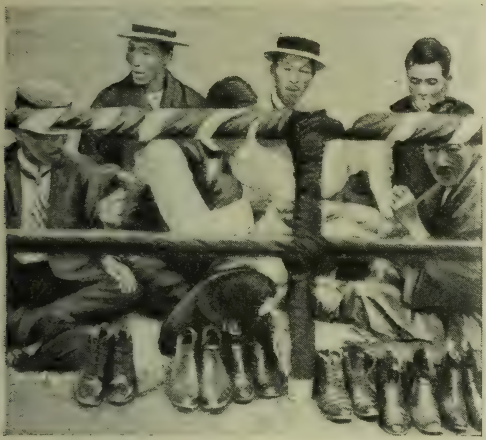
WIRELESS AN AID IN THE MAKING OF MAPS

Wireless telegraphy is scheduled to play an important part in the mapping of Belgian Congo. According to advices from Brussels, preparations are being made to do a large part of the work with the aid of portable wireless sets. It is well known that an exact result can be obtained for the difference in longitude between any two points as shown by the difference in their respective astronomical times. It had been expected that, by reason of the absence of telegraph lines in that country, 10 years would be required for the making of the map, but with the use of wireless, the work, it is believed, can be finished in two years.

¶An unusually large photographic objective, having a focal length of 15 ft. and a full opening of over 6 in., was recently made by one of Germany's great optical manufacturers. It gives absolutely sharp definition within a space of 7 by 9½ in., and in a picture of the clock tower of a church, taken at a distance of 2½ miles, the minute divisions of the clock dial could be clearly discerned.

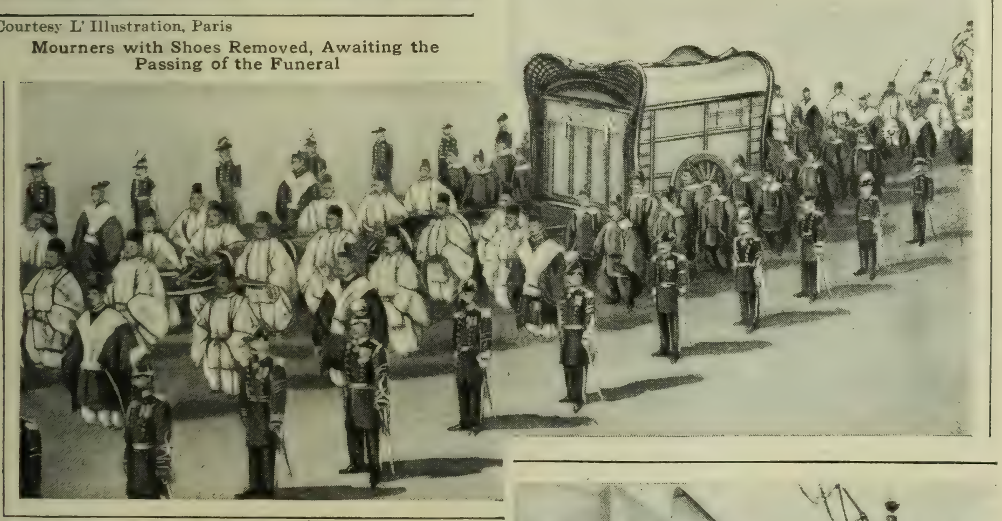
FUNERAL OF JAPAN'S EMPEROR

Some of the interesting features of the funeral of the Emperor of Japan are shown in the accompanying illustrations. The stand inclosed with black and white cloth is one of several that were located at advantageous points along the line of march, erected as shields behind which to hide the photographers who took the funeral pictures. It would have been sacrilege to allow the camera men to take the pictures in the open manner customary in America. The funeral cortege passed in the night, and, as the exploding of flashlight powder could not for a moment be thought of, the center of the photographers' stands was equipped with powerful electric lights and reflectors.



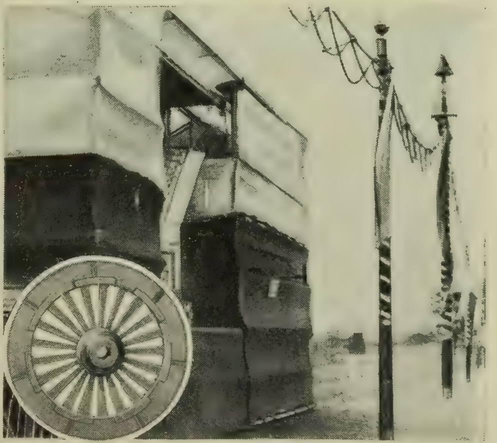
Courtesy L' Illustration, Paris

Mourners with Shoes Removed, Awaiting the Passing of the Funeral



Courtesy Illustrated London News

Funeral Car, Drawn by Oxen, and Giving Melancholy Creaks as It Passed Along

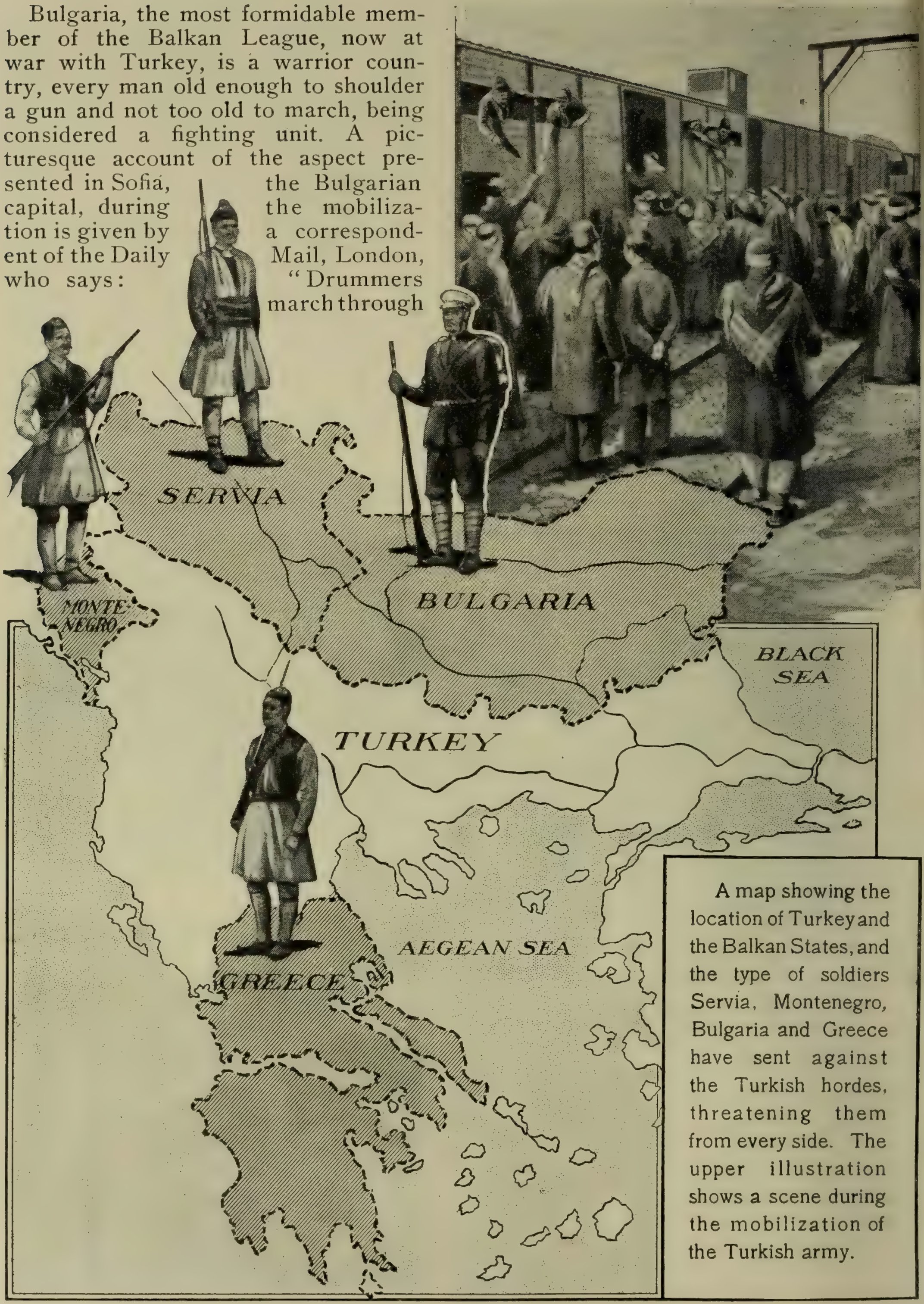


Lower Picture: Shielded Stands of the Photographers and, in Insert, Wheel Constructed to Give Melancholy Creaks

The funeral car, especially built to carry the coffin, which weighed more than 3,000 lb., moved on two wheels, each of which was constructed to give seven different melancholy creaks. One of the wheels is shown. A peculiar mark of respect was paid by the people awaiting the passing of the funeral cortege by removing their shoes and placing them in front.

BALKAN WAR CLOUD, FOR YEARS MENACING

Bulgaria, the most formidable member of the Balkan League, now at war with Turkey, is a warrior country, every man old enough to shoulder a gun and not too old to march, being considered a fighting unit. A picturesque account of the aspect presented in Sofia, the Bulgarian capital, during the mobilization is given by a correspondent of the Daily Mail, London, who says: "Drummers march through

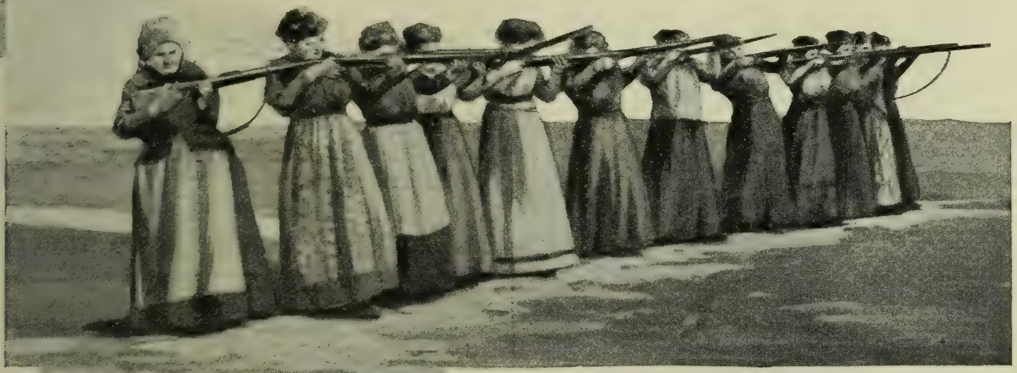


A map showing the location of Turkey and the Balkan States, and the type of soldiers Servia, Montenegro, Bulgaria and Greece have sent against the Turkish hordes, threatening them from every side. The upper illustration shows a scene during the mobilization of the Turkish army.

Courtesy Illustrated London News

the streets beating up reservists. Bread becomes hourly dearer. It is difficult to get a meal at the restaurants, as the cooks and waiters have been called to the colors. Soldiers with fixed bayonets patrol the streets. Everyone must be indoors at 10 o'clock each night. Thousands and thousands of peasants are arriving in the capital to buy arms. Trains, arriving and departing, are so crowded that the people sit on the footboards and lie on the tops of the carriages. The railway station presents an unforgettable sight, with endless lines of trains, whose engines have been standing for hours under steam unable to depart because the line is blocked with traffic.

"All the shops are closed. The tramway service has ceased. Cab horses



Courtesy The Graphic, London

Servian women will fight as actual soldiers in defense of their country, should Turkey become the aggressor. Many Macedonians have thrown over allegiance to Turkey, and fight as volunteers with the Servian army.

Courtesy L' Illustration, Paris

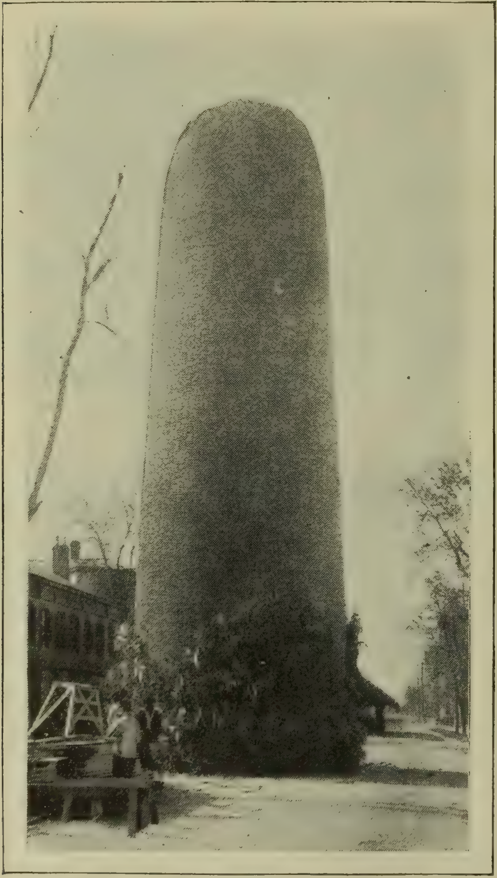
have been commandeered. Even foreign business men have to hand over their motor cars if the authorities requisition them. Uniforms are already exhausted, and the reservists are being handed scarfs and armbands in the national colors, pending the arrival of more uniforms. Thirty thousand rifles and 100,000 overcoats have arrived from Russia."

Similar scenes were enacted in Montenegro and Servia. Montenegro is a nation of warrior-shepherds. The field armies of the foes of Turkey are given as: Bulgaria, 350,000 men; Servia, 180,000; Montenegro, 50,000; and Greece, 100,000. Turkey in Europe has a field army of 600,000 men, and Turkey in Asia, 160,000 men.

Aeroplanes are playing an important part. Bulgaria's "fourth arm" comprises about 20 aeroplanes of different makes, with as many trained military airmen. Servia has about eight aeroplanes, with as many airmen; Greece has a number of aeroplanes and six military airmen trained in France, and Turkey also has a number of machines, eight trained native airmen, and two German airmen serving as instructors.

AN EAR OF CORN SIXTY FEET IN HEIGHT

Among the interesting decorative features of the first annual Industrial Exposition and Corn Show of Terre Haute, Indiana, was a 60-ft. ear of corn, composed of a framework veneered with ears of yellow corn. An American flag, 36 ft. long by 25 ft. wide, was formed of red, white and blue corn, arranged on a slanting framework. The coal fields of Indiana were represented by a monument artistically carved out of real coal, and the glass industries by a bottle 16 ft. in height.



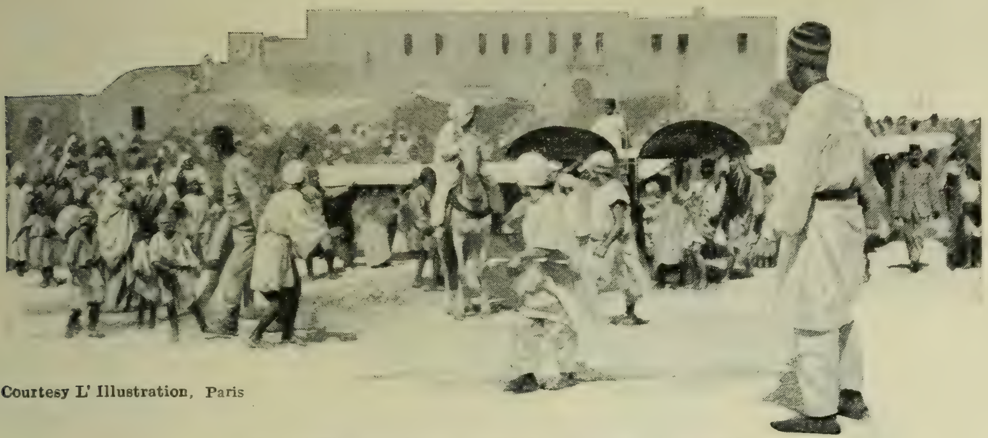
A 60-Ft. Ear of Corn Composed of Thousands of Little Ears

MARCONI THREATENED WITH LOSS OF SIGHT

The automobile accident in which Sig. Marconi figured in Italy recently resulted more disastrously than was at first expected. The injury to the right eye, which threatened the famous wireless inventor with total blindness, necessitated its removal in order to save the left, the operation being performed at Spezia, by Prof. Ernst Fuchs, the celebrated oculist of the University of Vienna. Marconi stood the painful operation without flinching.

¶A company is being formed in Brazil for the purpose of exploiting the water power of the Paulo Affonso Falls, some 150 miles from the mouth of San Francisco River, the total power being estimated at 1,300,000 hp., of which at first only 200,000 will be utilized.

FIRST AEROPLANE CAPTURE IN WARFARE



Courtesy L' Illustration, Paris

The Italian Aeroplane Captured by Arabs in Tripoli

In view of the part the aeroplane is destined to play in modern warfare and has played in the recently concluded war operations in Tripoli, such an occurrence as the capturing of an aeroplane by the enemy would naturally be anticipated. But the incident depicted in the illustration herewith, so far, stands alone in the history of war. It shows the flying machine of Capt. Riccardo Moizo, of the Italian artillery, captured by the Arabs, Sept. 9, when he was compelled to descend near their camp on account of a faulty motor. The natives who hauled the machine away raised the two hinged sections of the horizontal rudder, as shown, and a young negro boy is standing in the body. The machine was a Nieuport-type monoplane.

NEW METHOD OF DRYING OUT PASTE

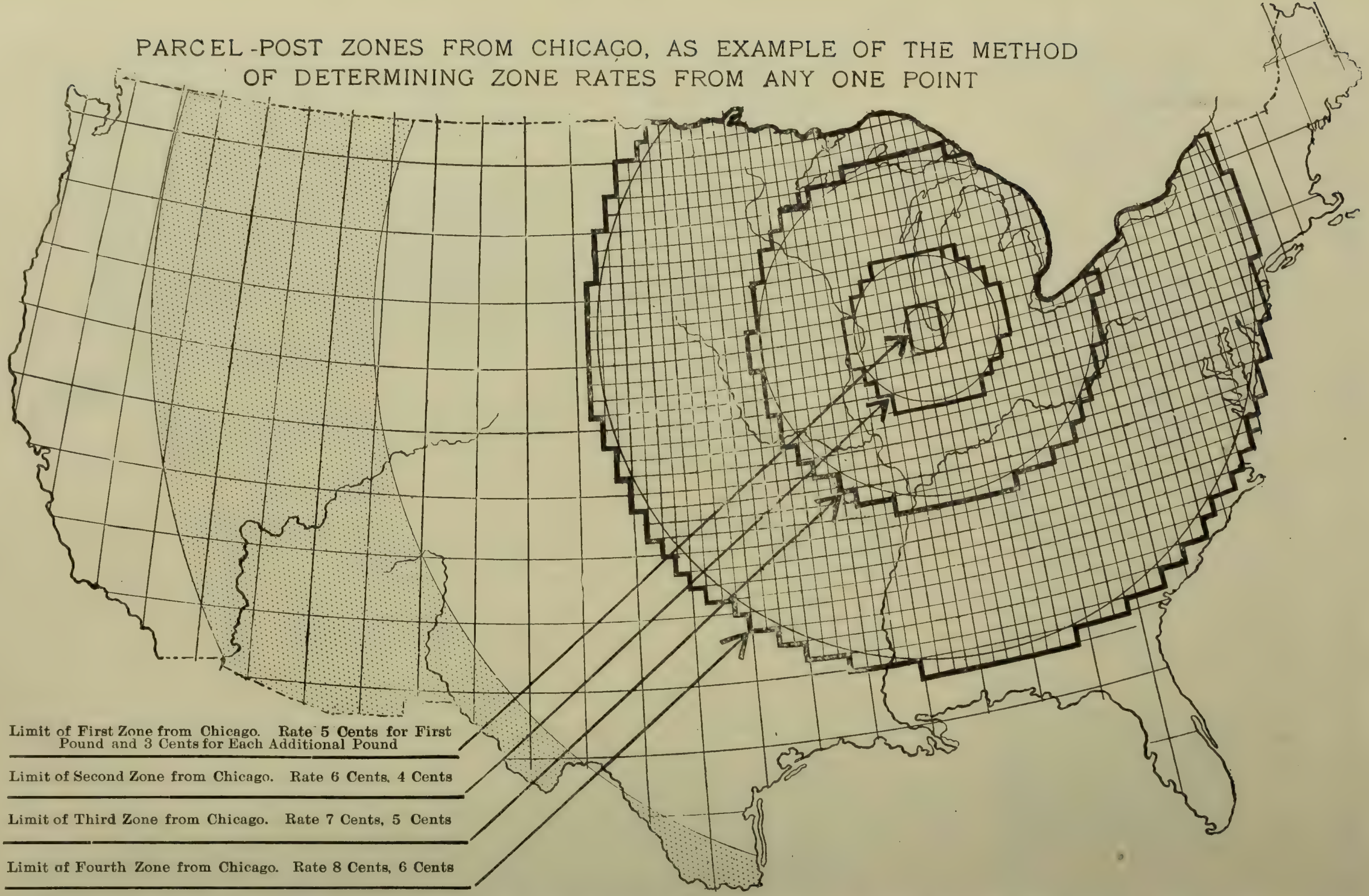
A quite ingenious innovation in the drying out of the more or less fluid paste which, in certain industries, is one of the intermediate stages between raw material and finished product, is the invention of a French engineer.

In its general lines the drier does not differ from the ordinary type, but the usual endless conveyor is here replaced by a belt of wire cloth. The meshes of this cloth are spiral in shape, which, besides making the cloth thick, gives it a great degree of longitudinal elasticity so that it passes over pulleys and rollers with ease and even tension. Passing through the paste container, the interstices between the meshes of the belt are filled with paste, any surplus being removed by suitable and conveniently placed scrapers. The belt then passes through the drying chamber, and at the other end the dried paste, lodging in the meshes, is knocked off by shakers and drops into a receptacle; the belt then again passing to the paste trough, and the operation continuing. Very little power is required to drive the belt, two horsepower being sufficient for a drier handling 1,100 lb. of paste an hour.

AIRMAN KILLED IN BATTLE

The first military airman killed in actual war was brought crashing to the ground with his aeroplane by shrapnel shells while flying over Adrianople. His name was Popoff, and he had been an aviation instructor in the Russian army until he recently joined the Bulgarian forces.

PARCEL-POST ZONES FROM CHICAGO, AS EXAMPLE OF THE METHOD OF DETERMINING ZONE RATES FROM ANY ONE POINT


Limit of First Zone from Chicago. Rate 5 Cents for First Pound and 3 Cents for Each Additional Pound
Limit of Second Zone from Chicago. Rate 6 Cents, 4 Cents
Limit of Third Zone from Chicago. Rate 7 Cents, 5 Cents
Limit of Fourth Zone from Chicago. Rate 8 Cents, 6 Cents

The country is divided into 3,500 quadrangles or units, such as are shown in the center part of the map, each area being half of a degree of latitude by half a degree of longitude. These quadrangles are the units of figuring, and all post offices in any one of these units use the same rates. The second zone is obtained by finding the center of the quadrangle in which Chicago is located, and drawing from that a circle of 150 miles radius. Every quadrangle or unit which comes wholly or partly within that circle, but outside of the first zone, has the second-zone rates on parcels from Chicago. The other, wider zones from the Chicago quadrangle are found in the same way, by means of larger circles. Each of the 3,500 quadrangles will have its own set of zones, worked out separately on postal maps.

THE ZONE SYSTEM OF THE NEW PARCEL POST

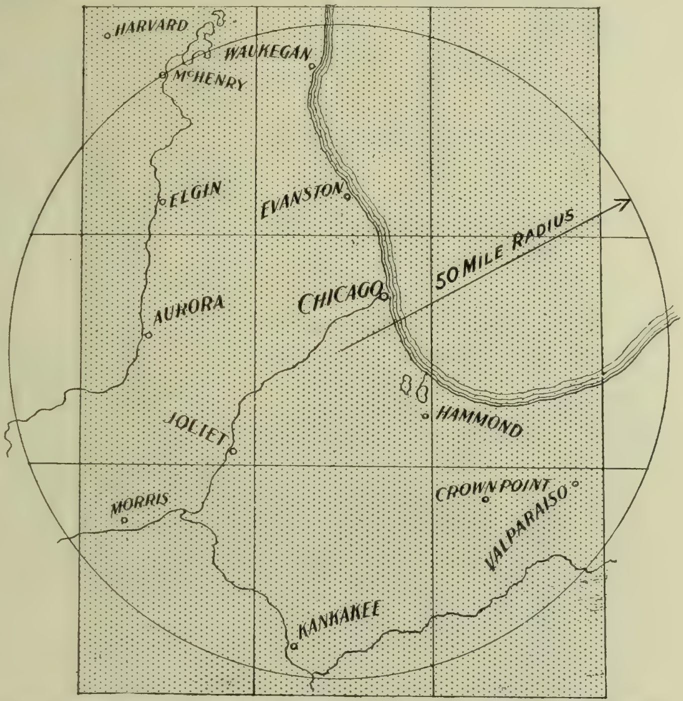
When the parcel post goes into effect on the first of January, the operation of the zone system of rates on parcels is sure to cause much confusion, for on the face of things it is very complicated, though actually based on a very simple principle. Each post office, by that time, will be supplied with maps, showing its own zones, and handbooks of information, but it is possible now to work out, by means of reliable maps, the zones from any point in the United States, and the accompanying map shows the zones of rates on parcels mailed in Chicago as an example.

The purpose of the zones is to charge postage on a parcel according to the distance it is sent, the long hauls by railroad requiring greater postage to make the system self-supporting. In order to avoid too great complications, only eight zones will be established.

Establishing zones by drawing circles of different diameters, with each post office as a center, would mean an impracticable amount of figuring, so instead of using townships or counties as units or starting points, it was decided to divide the whole country into blocks or units, each block being half a degree of latitude in north-south extension and half a degree of longitude east and west. There are 3,500 of these units in the country. Every post office figures its rates from the unit in which it is located, and all post offices in that unit use the same rates.

To get the first zone the following process is employed: Find the center of the unit in which your post office is located. Draw a circle of 50 miles radius around that center. Every unit which lies wholly within that circle, or more than half of which is within that circle, is included in the first zone from any post office, and the postage rate is 5 cents for the first pound, and 3 cents for each additional pound.

The second zone is determined by drawing with the same center a circle of 150 miles radius. Every unit which lies wholly or in part, even a small part, within this circle is in the second zone from any post office, and the rate is 6 cents for the first pound, and 4 cents for each additional pound.



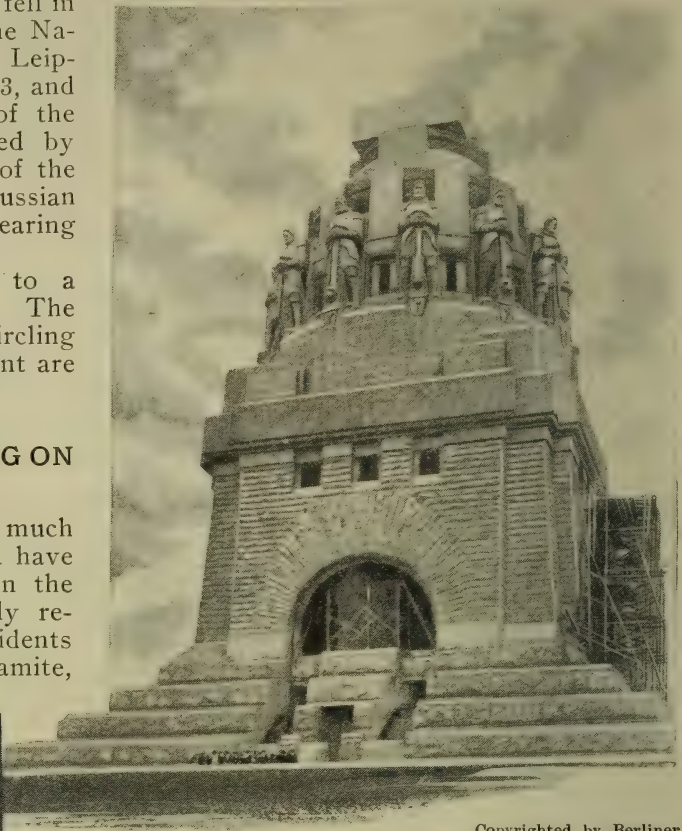
First Rate Zone of Chicago Includes All Units within a 50-Mile Radius from the Center of the Chicago Unit, except Those Being More Than Half Outside the Circle. Thus Nine Units are Included in the Zone

The method by which the second zone is determined is used for all the other zones; their radii and rate of postage for first and additional pounds, respectively, being as follows: Third zone, 300 miles; 7 cents, 5 cents. Fourth zone, 600 miles; 8 cents, 6 cents. Fifth zone, 1,000 miles; 9 cents, 7 cents. Sixth zone, 1,400 miles; 10 cents, 9 cents. Seventh zone, 1,800 miles; 11 cents, 10 cents; and the eighth zone, all territory still further away, including the Philippines and island possessions, 12 cents flat.

GERMANY'S BATTLE-OF-NATIONS MEMORIAL

The cyclopean monument being erected in Leipzig, Germany, as a memorial to the heroes who fell in the famous "Battle of the Nations," which raged near Leipzig for three days in 1813, and resulted in the defeat of the French army commanded by Napoleon at the hands of the Prussian, Austrian, Russian and Swedish armies, is nearing completion.

The vast pile rises to a height of about 300 ft. The colossal stone figures circling the dome of the monument are each 40 ft. in height.



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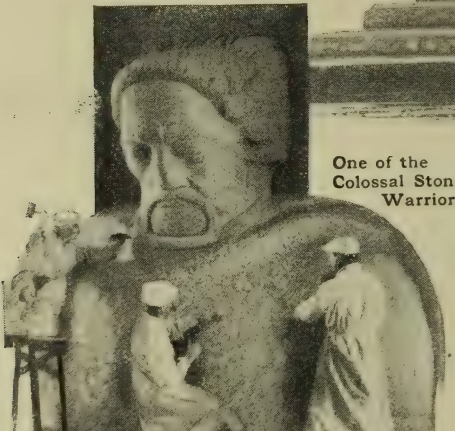
Huge German War Monument Nearing Completion



One of the Colossal Stone Warriors

DYNAMITE BLASTING ON THE CANAL

Scientific study and much practical experimentation have enabled the engineers on the Panama Canal to greatly reduce the number of accidents due to misfiring of dynamite, especially the delayed accidental explosions of dynamite which did not fire at the time planned. An account of these results has recently been given by Arthur Lee Robinson of the canal force.

In one year 5,087,000 lb. of dynamite were used on the canal, and a great deal of trouble resulted from the striking of unexploded dynamite by the steam shovels. This wrecked the steam shovels and injured the operators. It was thought that the failure of the dynamite to explode was due to the fact that even the best detonators soaked up enough water, when kept submerged 24 hours, to render them, in part, useless. When a number of charges, often a hundred, were set off, only about 90 exploded, and the other 10 remained to cause accidents.

The manufacturers of detonators were notified of the trouble, and later it became possible to purchase detonators which were waterproof. When these were procured, and the best grades of dynamite purchased, it was believed that accidents from unexploded dynamite would cease, but accidental explosions still came.

Mr. Robinson found that the unexploded charges resulted from the use of ordinary hand batteries which are usually employed for this purpose. By using transformers, such as employed on ordinary alternating-current lighting circuits, and connecting each charge with a separate wire (connection in parallel), it was found that all of the charges were exploded. Thus by these simple changes a very great saving of money and of lives has been effected.

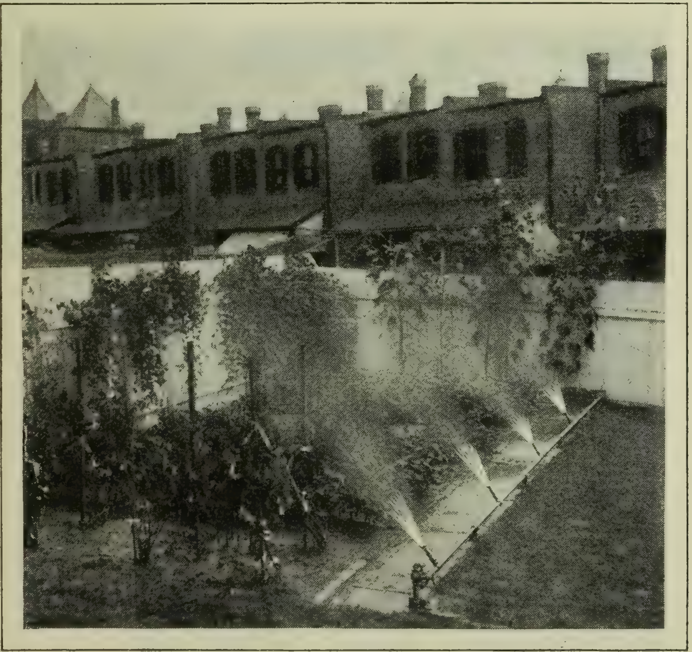
ELECTRIC FLASHING SIGN ON MOTOR TRUCK

Using the sides of the body of a motor delivery truck as a "flashing" electric sign, the letters of which are brought out in succession, first in one color and then another, as the truck runs through the streets after dark, is a new idea in electric-sign practice. Several motor delivery trucks have been so equipped recently, and changeable effects of almost any variety are possible, such, for instance, as spelling out the sign letter by letter, intermittently appearing trade-marks, "chasing" borders, flaming torches, and the like. The electricity is supplied by a generator driven by the engine, operating the motor of the flasher, and providing current for all the lamps used about the vehicle, as well as for the signs. The surplus energy is used to charge a storage battery, which supplies electricity when the engine is not running.

IDEAL IRRIGATION WITH A BACK-YARD PLANT

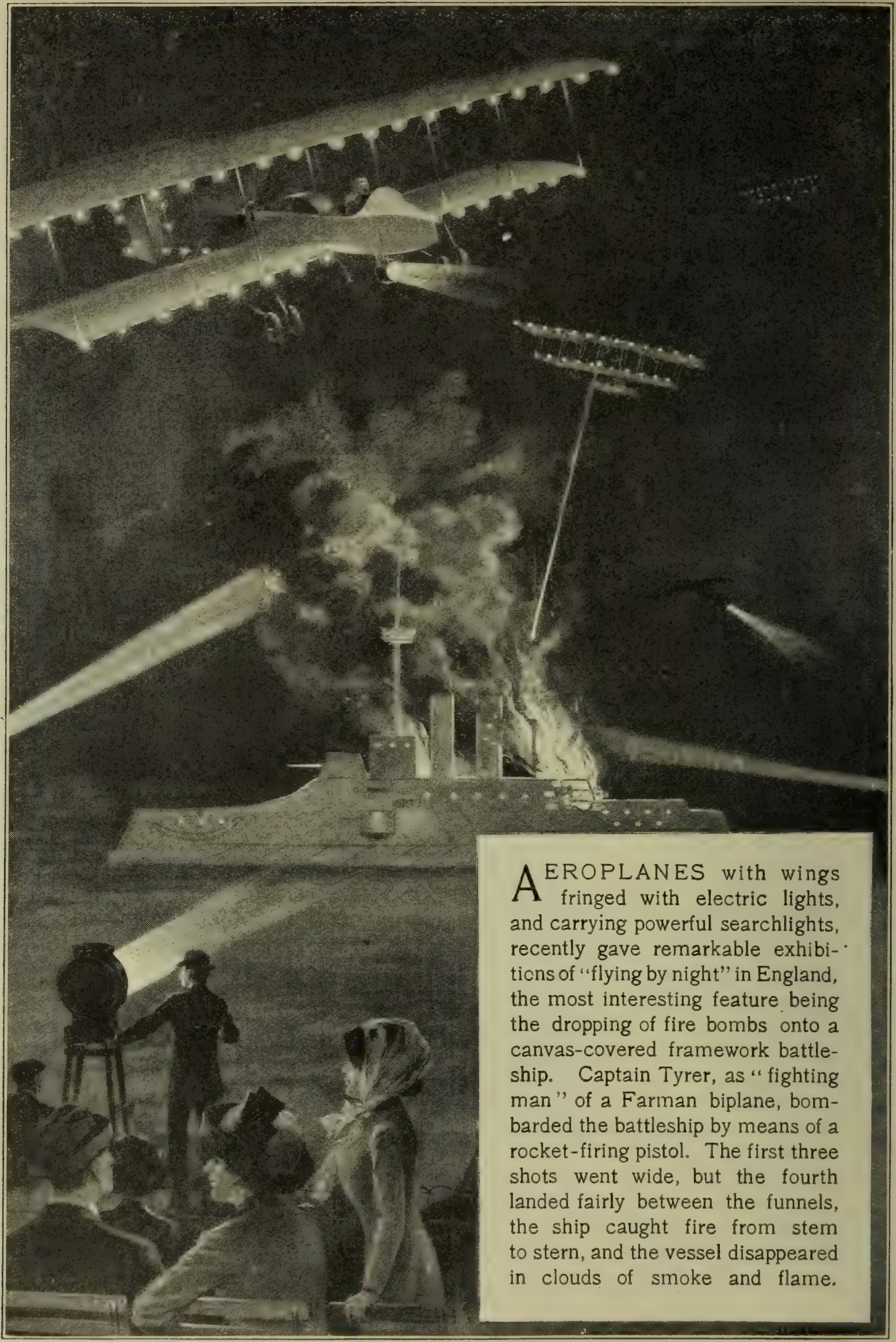
A miniature irrigation plant, costing only a few dollars but greatly lessening the work of flower or vegetable gardening, was operated the past summer by a Washington man.

It is simply a pipe line composed of 6-ft. sections of 1-in. galvanized pipe and supported about 6 in. from the ground by bearings fashioned out of pipe fittings. The line extends through the center of the yard, one end being attached to a vertical pipe which is provided with a coupling for attaching a garden hose and a valve to regulate the water supply. The other end is closed and supported by a flange fastened against the rear fence. The 6-ft. sections are joined "tees," to each of which a brass garden-hose nozzle is attached, and the main pipe can be turned so that the nozzles will throw water to either side of the yard. By adjusting the nozzles the streams of water can be varied from a full flow to a fine spray.



Back-Yard Homemade Irrigation Plant

ILLUMINATED AEROPLANES DESTROY BATTLESHIP

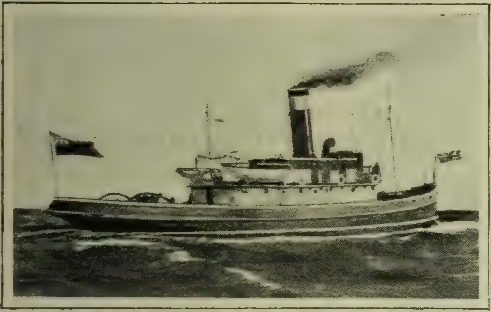


AEROPLANES with wings fringed with electric lights, and carrying powerful searchlights, recently gave remarkable exhibitions of "flying by night" in England, the most interesting feature being the dropping of fire bombs onto a canvas-covered framework battleship. Captain Tyrer, as "fighting man" of a Farman biplane, bombarded the battleship by means of a rocket-firing pistol. The first three shots went wide, but the fourth landed fairly between the funnels, the ship caught fire from stem to stern, and the vessel disappeared in clouds of smoke and flame.

LUXURIOUS TUG MAKES LONG JOURNEY

The ocean-going tug "Dreadful," a 125-ft. vessel built by one of the English shipbuilding companies for a Canadian lumber concern, which will use it for towing rafts of logs in Vancouver Bay and the rivers flowing into it, made the journey of about 15,000 miles across the Atlantic, around South America and up the Pacific coast to Vancouver in 72 days.

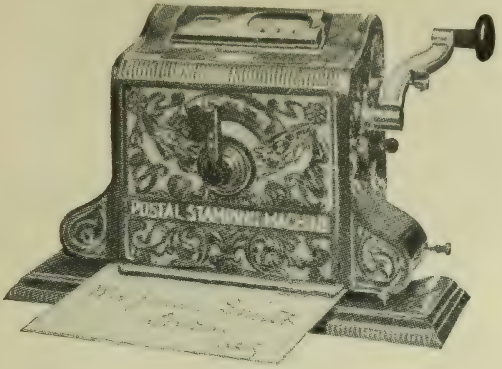
One of the interesting features of this tug is the exceptional accommodations afforded. On the main deck is the chief officer's cabin, officers' mess room, store, galley, and guests' saloon. On the bridge is the captain's cabin, and two guest rooms; the engineer's quarters below the main deck include a special saloon, and the crew is berthed forward. There are steam radiators in all the quarters, and electric lighting throughout.



An Ocean-Going Logging Tug Which Made a Journey of 15,000 Miles

NEW ZEALAND'S POSTAL STAMPING MACHINE

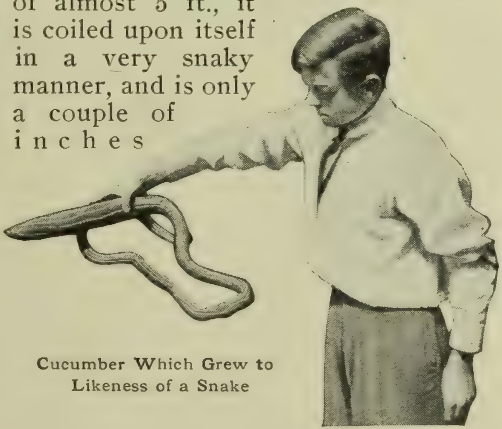
The first government to adopt the stamping machine for use, where the outgoing letter mail is heavy, in place of the postage stamp was New Zealand, which has been using the machine shown in the illustration for some time. At the bottom of the machine is an opening in which the mail to be stamped is inserted. The indicator hand shown at the front of the machine is then turned to the slot desired, one slot giving half-penny impressions, the next one-penny, and so on, up to a shilling. The handle release is then depressed and the handle pushed around until a complete revolution has been made. As each stamp impression is made on the letters, the set of dials, shown at the top, automatically records the value.



The Postage-Stamping Machine Adopted by the New Zealand Government

RATTLESNAKE CUCUMBER

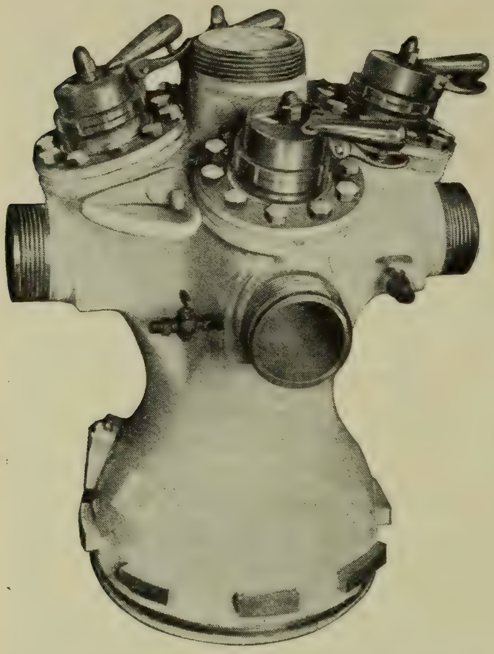
What might be called a rattlesnake cucumber has been grown in a Los Angeles garden. While it has a length of almost 5 ft., it is coiled upon itself in a very snaky manner, and is only a couple of inches thick. This variety is very common in the southwest, but it is not often that one finds such a "wriggly" specimen on the Pacific coast. When displayed in a local store window, it was fitted with a pair of shoe-button eyes, a little tongue and a real "rattle," and made a very startling appearance.



Cucumber Which Grew to Likeness of a Snake

PORTABLE HIGH-PRESSURE FIRE-HYDRANT HEADS

Ingenious portable fire-hydrant heads, especially designed for high-pressure fire service, are used in Baltimore. The heads are carried on the hose wagons or auto trucks of the department along with the hose and other fire-fighting apparatus. Thus, only a comparatively small number of such heads are required to equip the entire system, while the standpipes or flush hydrants to which they are to be attached may run up into the thousands.


One of the Portable Fire-Hose Heads for the Flush Hydrants of the Baltimore High-Pressure Fire System

Two grab handles are provided, and one man can readily lift the head and drop it into position on the flush hydrant when the cover of the latter has been removed. A latch securely locks the head in position, and it is claimed that the connecting of the portable head with the flush hydrant can be accomplished in much less time than it takes to connect the usual hose coupling to an ordinary fire hydrant.

The portable head, complete, weighs no more than 110 lb., and has five openings, of which four will receive 2½-in. hose couplings, while the fifth, which rises from the top of the head, is fitted for a 3-in. hose coupling, or for direct connection of a monitor nozzle, to be used when the fire is sufficiently near to be played upon from the position of the hydrant.

The valve levers, by means of which the pressure of water passing through each connection is regulated, are clearly shown in the illustration.

UNCLE SAM IS THE SHOPKEEPER IN PANAMA

To the average person the work that Col. George Washington Goethals and his associates of the Isthmian Canal Commission are doing in Panama is simply building a canal.

There is a lot more to the business, however, which the ordinary person does not think of and which never occurs at all to one who simply glances through the articles and at the pictures of the daily or periodical press. Occasionally there will be a line or two in the papers about Colonel Gorgas, of the army medical department, and the work he has done in ridding the Canal Zone of yellow fever. But is there anything on record about the real-estate business, the hotel department, the landscape-gardener's work or—last, but biggest of all—the grocery department? Scarcely a line. The last named, which is one of the greatest institutions of its kind in the world, is officially known as the commissary department of the canal commission and is managed by a number of clever army officers. And it deals not only in groceries but in hardware, dry goods, furniture, boots and shoes, stationery, and all of the things a person needs to make him comfortable in his home.

The business of the canal commissary department during the fiscal year ending June 30, amounted to over $6,700,000. How many grocery stores or department stores in the United States carry on such an enormous business? In the same period, it disposed of more than 6,000,000 lb. of fresh meat and almost 2,000,000 lb. of flour; operated a laundry, that washed and pressed 4,243,614 pieces of clothing; a bakery, that consumed 20,233 bbl. of flour and turned out 6,014,667 loaves of bread, 651,844 rolls, and 114,134 lb. of cake; an ice-cream plant, that produced 138,551 gal. of ice cream during the year, and, if necessary, can put out 50 gal. of ice cream every hour of the day and night, 365 days of the year.

These are only a few of the things that are necessary in the building of the canal. The high cost of living has not troubled the people in the Canal Zone very much, because the commissary is not run with the idea of making a profit, and the articles bought from it, therefore, are usually somewhat lower in price than the same things in the United States. The government makes a charge above the cost only to cover the expense of transportation and handling.

"Putting" on an Indoor Green in a London Golf School

Practicing Driving Off. The Ball may be Struck with All the Force of the Actual Out-Door Game, Netting being Provided to Stop Its Flight

Courtesy of The Sketch

Lower View Shows a Golfer Playing Out of the Indoor Sand Bunker

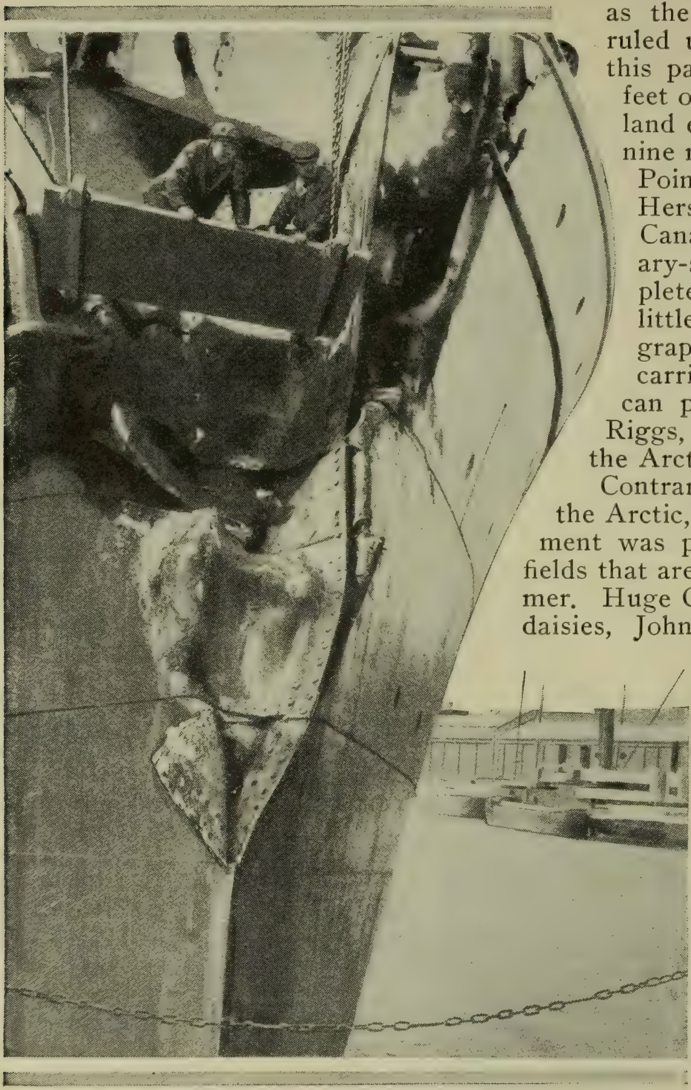
PLAYING GOLF INDOORS

All the strokes of golf, with the actual force put into them when playing on a regular golf course, can be executed in a London golf school. This school has in fact an indoor golf course. One cannot, to be sure, wander over hill and dale, making hole after hole, but the drive can be made from a mat, the ball being caught by netting; the "iron" shots, from real grass; the putting is done on an undulating green of real grass, and a sand bunker is also provided.

ℭThe revenue cutter "Unalga," a 190-ft. vessel built at Newport News for service on the Pacific, left recently for Port Townsend, Wash., by way of the Suez Canal. The journey of about 18,000 miles will take four months.

THE ICEBERG-DAMAGED "CORSICAN"

The damage done to the bow of the Allan liner "Corsican" in collision with an iceberg is here clearly shown, the plates being crushed and twisted out of shape. The liner, en route to Liverpool from Canada, struck the iceberg near Belle Isle off the coast of Newfoundland, but was able to continue its voyage to Liverpool.



The Bow of the Allan Liner "Corsican" Crushed by a Collision with an Iceberg

ERECTING BOUNDARIES IN ARCTIC WILDS

The last of the long chain of bronze monuments that mark the Alaskan boundary between the United States and Canada in as straight a line as the broad red line that is ruled up the map, was planted this past summer within a few feet of the Arctic Ocean, at the land end of the 141st meridian, nine miles east of Demarcation Point and 40 miles west of Herschel Island. The joint Canadian-American boundary-survey parties have completed their work except for a little checking and topographical survey that may be carried on later. The American party headed by Thomas Riggs, Jr., has returned from the Arctic.

Contrary to a common idea of the Arctic, the last boundary monument was planted in luscious green fields that are a mass of bloom in summer. Huge California poppies, lupine, daisies, Johnny-jump-ups, blue bells and most of the common American field flowers bloom in bright patches about it. Close by is a low-cut bank which is the beach of the almost tideless ocean. The maximum tide observed by the surveyors this last summer was 8 in.

The monuments are set approximately four miles apart and some of those planted this year are in almost inaccessible spots in the rugged, barren Arctic Range. The Canadian party planted the monuments on the line the Americans surveyed, and when pack horses could not reach the points, monuments, materials and tools had to be carried on men's backs up the towering cliffs.

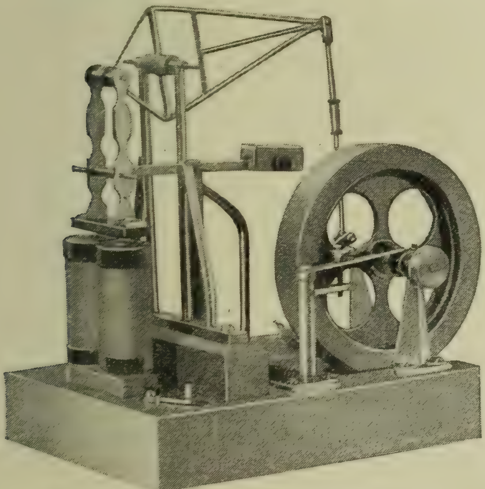
Work began this year at Rampart house, the oldest of the old Hudson Bay Company's posts in Yukon Territory. The task was completed without mishap through a country of sparse timber. The midnight sun shone through the summer and for a few hours at midday the weather was quite warm.

The surveyors report finding thousands of hair seals at the Arctic Ocean. They saw many field mice, white fox, squirrels, gophers, eider duck, geese and ptarmigan. In summer it appeared to them a pleasant land, but they also found, in the vast tundra, skeletons of men, one of which was identified as the bones of a white man, probably some trapper or trader who had lain down to die in an Arctic storm.

AN ELECTRIC MOTOR WITH "WALKING BEAM"

An eastern inventor has constructed a little electric motor, or, perhaps, an electric engine would be a more appropriate term, inasmuch as it has a walking beam and is not unlike the steam engine of a river steamboat.

This model electric engine is very small, the flywheel being only 6 in. in diameter, and the base 11 in. long by 9 in. wide. It runs nicely on dry batteries, and the inventor is constructing a large engine on the same principle.



An Ingenious "Walking-Beam" Electric Engine Operated by Dry Cells

"TEDDY BULL MOOSE" ENTERS LISTS AGAINST BEAR

The "Teddy Bull Moose" has entered the lists against the "Teddy Bear" and threatens to crowd the bear out of the toy stores during the coming holiday season. The "Teddy Bear" is still one of the most popular toys in the market, according to the manufacturers, all efforts to create a substitute having failed. The new toy resembles the bear in every respect except as to the head, which is that of a moose with a pair of stout horns and made of unbreakable material. As in the bear, the head and legs are so made that the "Teddy Bull Moose" can stand in any position and turn its head at any angle. It also has an additional attraction in that it is provided with a full set of teeth which, in the larger models, are prominently displayed.

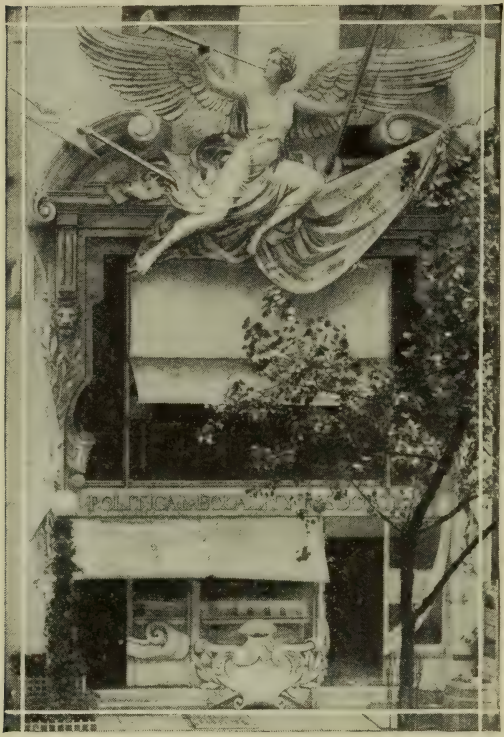
"Teddy Bull Moose" Makes a Bid for Some of Teddy Bear's Popularity

PHONOGRAPH SERMONS FOR LEPERS

The use of phonographs in leper colonies and pest houses for preaching sermons to the unfortunates is recommended by Dr. Muza Ben Yussel, of Alexandria, Egypt, who was recently in this country attending the International Congress of Hygiene. He sees no reason why the great preachers of all creeds should not talk to these outcasts of the world through the medium of the talking machine.

"VICTORY" STATUE ON SUFFRAGETTE HOME

Above the front of the suffragette headquarters in New York is a heroic copper statue of "Victory," represented in the form of an angel, blowing a trumpet. It has been suggested that the London suffragettes mount a statue of similar nature, but that the angel use a hammer on a plate-glass window instead of blowing a trumpet.



The "Angel of Victory" of the Suffragettes

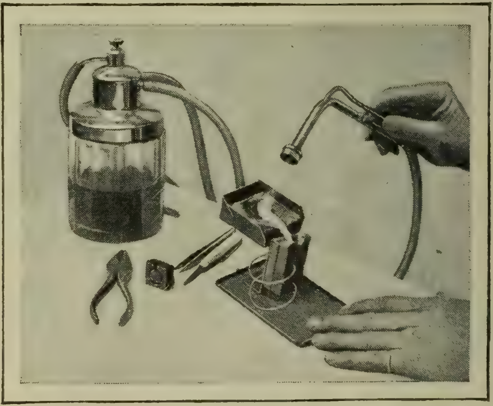
WHY SKATING ON GLASS IS NOT FEASIBLE

The fact that one can skate on the hardest ice, but not on an equally hard surface of glass has been explained by a German scientist. The slide of the skate over the ice does not depend on the smoothness of the surface alone, but on the melting of a part, however small, of the ice under the blade. On the very small part of the latter which is in contact with the ice, rests the comparatively great weight of the skater, so that the ice is subjected to a considerable pressure per unit of surface. With increasing pressure, the freezing temperature of water falls and it remains fluid even at temperatures lower than 32 deg. F. This partial melting of the ice under the pressure of the skater's weight, which is also of very short duration, is what makes skating possible, and at the same time furnishes a lubrication between the steel of the skate and the ice. A glass sheet, on the other hand, remains solid and so does not permit the grip of the skate.

MOLD FOR CASTING SEAMLESS WEDDING RINGS

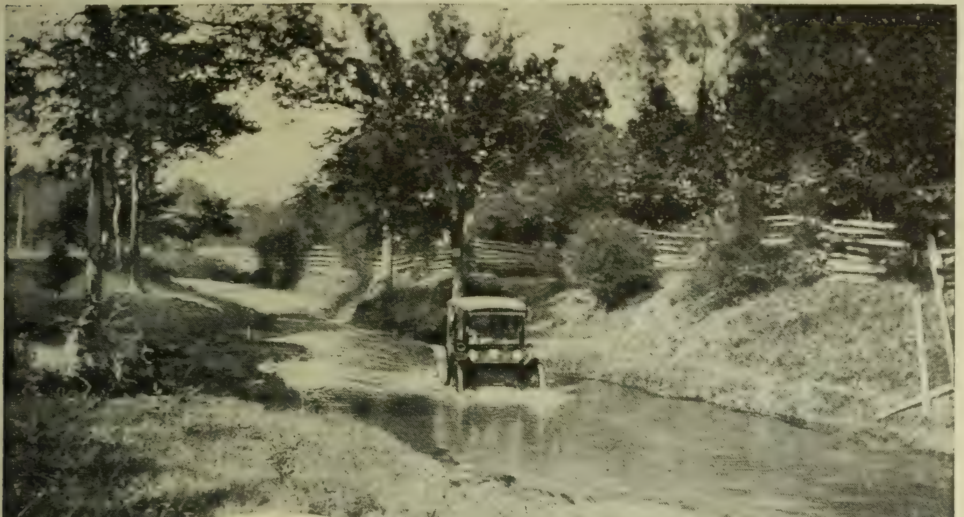
A practical mold for casting plain gold-band rings, invented by a western jeweler, has aroused considerable interest at the several jewelers' conventions where it has been exhibited, being, it is said, the first practical mold designed for that purpose.

With the outfit shown in the illustration any jeweler may melt old gold of any description, spectacle rims, teeth fillings or bridges, and the like, and form it into rings. The mold proper is made of one piece only, so that the gold ring is turned out seamless. After being taken from the mold, the ring is enlarged to the proper size on a stretcher, and polished, the whole operation consuming very little time.



Simple Mold and Accessories for Casting Gold Wedding Rings

ELECTRIC CAR AS GLIDDEN-TOUR PATHFINDER

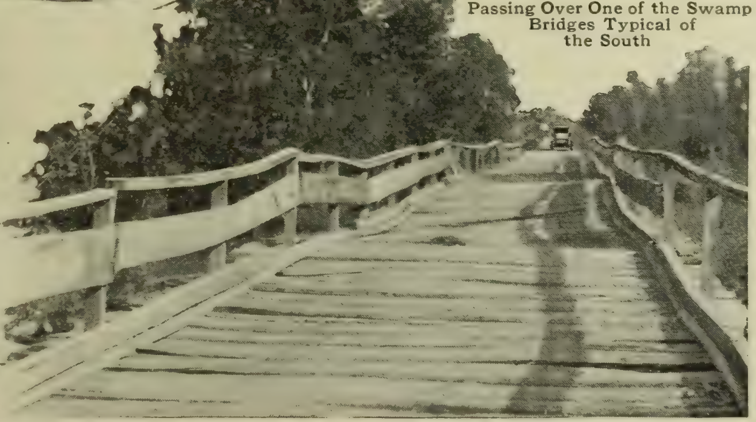


The Electric Glidden-Tour Pathfinder Navigating One of Many Washouts

Through Mile after Mile of Wretched Roads

Though the 1912 Glidden tour was abandoned, the route was set and the pathfinder was an electric instead of a gasoline car. The manner in which this machine accomplished the task, over roads of all conditions, fording streams, and often cutting cross-country through fields, was remarkable.

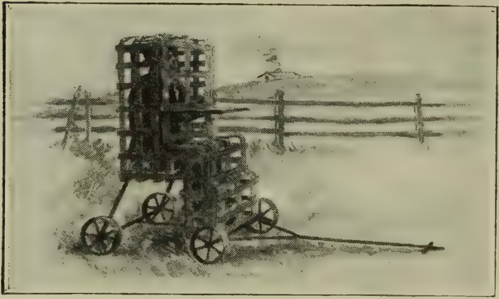
The start was made from Detroit late in July. Roads were fair until Memphis, Tenn., was reached. Leaving Memphis, the route lay along the levee, where the floods were so bad last spring. The roads were frightful and washouts very common, and the



Passing Over One of the Swamp Bridges Typical of the South car had to perform tasks of a nature that have been considered impossible for electrics, entering New Orleans but little the worse for wear.

IRON-CHAIR "CHARIOT" FOR TRAMPS

The most "trampless" town in Maine is Bingham, according to residents of that place, and the reason is the iron chair shown in the accompanying illustration. It is called the "tramp chair," and is a strap-iron cage so shaped that the vagrant within it is kept in a seated position. It is mounted on wheels, and may be moved to any part of the town or left in the public square.


The "Tramp Chair" Which Causes Tramps to Avoid Bingham, Maine

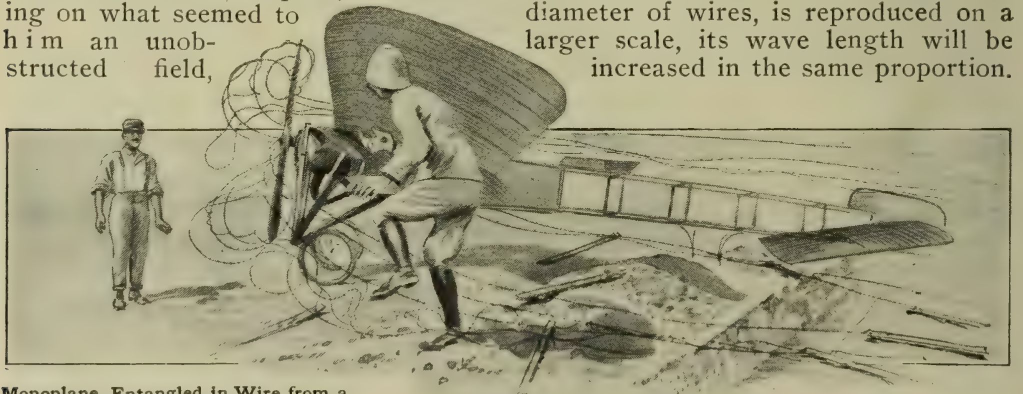
WAR AIRMAN PLOWS UP WIRE FENCE

One of the French army aeroplanes, or "avions" as they are called, recently came out undamaged of an unforeseen test in Morocco. The pilot, in descending on what seemed to him an unobstructed field, failed to notice a wire fence erected for purposes of defense, and a trench beyond it. His aeroplane ran with considerable force against the fence, tore through it and across, stopping on the embankment on the other side, with practically no injury to the machine.

ORGAN-PIPE PRINCIPLE IN WIRELESS

Recent investigations by a French scientist have brought out the peculiar fact that the relation between the length of a wireless antenna consisting of a single wire and its fundamental wave length is practically the same as that subsisting between the wave length of the sound produced by an organ pipe and the latter's length. This relation of sound wave to length of pipe is as four to one, while the wave sent out by a wireless antenna is a little more than four times as long as the antenna.

In the case of antennæ consisting of several branches, the wave length is greater. With a great number of wires placed rather far apart it is possible to increase the wave length to thrice that of a single wire. Thus an antenna 100 ft. high can be made to produce waves from 400 to 1,200 ft. long. When more complicated forms of antennæ are concerned, it is not possible to calculate the wave length in this manner, but it can be done by working with reduced models, for it has been established that if a model antenna of certain dimensions as to height, form, number and diameter of wires, is reproduced on a larger scale, its wave length will be increased in the same proportion.


Monoplane, Entangled in Wire from a Fence Through Which It had Run Unhurt

Courtesy of L' Illustration

STRANGE FIBERS USED FOR ARTIFICIAL WOOL

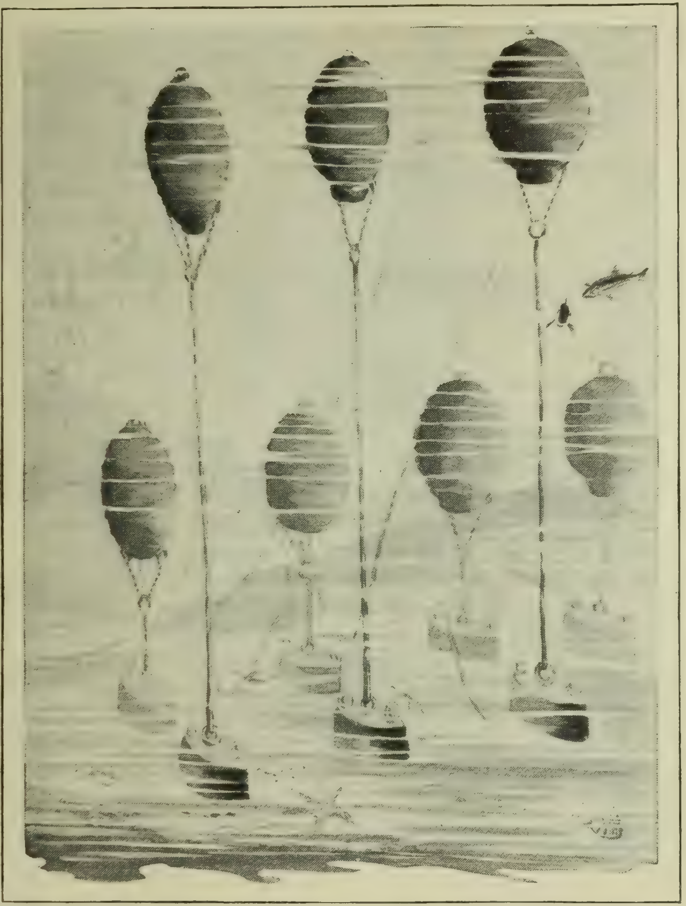
Among the fibers now in use for the production of artificial silk and wool are a variety of New Zealand flax, obtained by dredging shallow places in the sea, and banana fiber, which resembles jute and hemp. The first is found in very large quantities imbedded in sand, from which it is separated by washing. Chemical and microscopical examinations indicate that this fiber is a land plant which has been submerged by an incursion of the sea, thereby undergoing a process of natural "rotting." It is very cheaply produced and while rather brittle and deficient in tensile strength, it is still possible to use it in conjunction with wool or shoddy. In its natural state this fiber is rich in salts of soda and magnesia, which tend to make it noninflammable. In dyeing, it has been found to have strong attraction for basic colors. In this respect it is similar to jute.

The Chinese were the first to use the banana fiber, the supply of which is practically unlimited. The cloth produced from this fiber is very suitable for use in tropical countries, where the raw material is most accessible.

A metallic yarn has also been produced recently which consists of a core of any suitable material coated chemically with a metallic layer. It can be produced in all shades of gold and also in silver and copper in modern art shades.

LAY SUBMARINE MINES IN A TANK OF WATER

One of the great problems of coast defense lies in the studying of the proper placing of submarine mines. It has heretofore been very difficult to get accurate data on the manner in which the mines floated, etc. Of course, the technical officers who design the mines determine these points with more or less nicety by reason of the type of construction and the character of the material used. More information of a positive character is needed, however, and an officer of the British army has just devised a plan for obtaining it. At one of the British artillery stations, where a school of in-



The Glass Tank with Submarine Mines Used in a British School of Instruction for Artillery Officers struction is maintained, a large tank was constructed and filled with water, and electric mines of the contact type floated in it. By this means the officers at the school were enabled to study the effects of changing temperatures and currents, and the action of sea water as well as the resistance of the water to the operation of the various mechanical devices used in the explosion of the mines.

MILK ICE BLOCKS TO COOL MILK

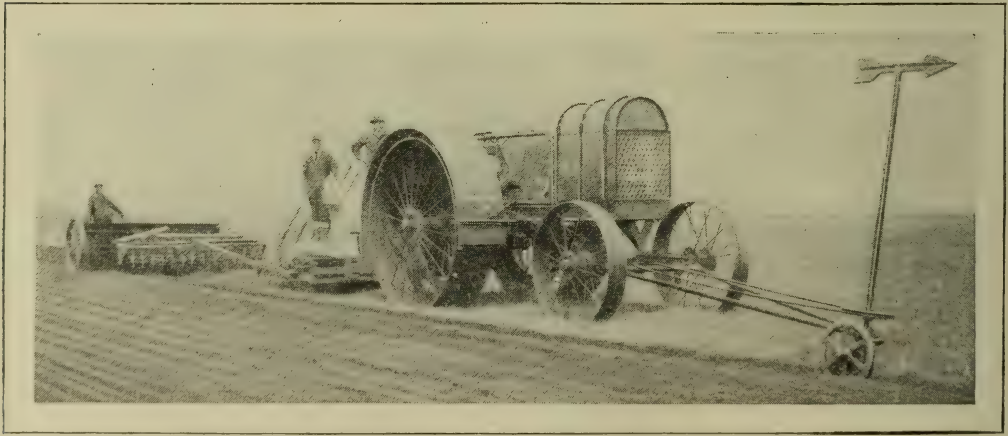
An unusual method of preparing milk for long-distance shipping has been adopted in the Brazilian province Minas Geraes, from which Rio de Janeiro draws most of its milk supply. Part of the fresh pasteurized milk (one-fourth to one-third) is frozen into solid cubes, weighing from 20 to 30 lb. each, and a number of them are placed in cans, having insulated walls and holding about 300 qt. The cans are then filled with milk, hermetically closed, and the whole cooled to 39 deg. F. It is said that milk shipped after such treatment will stand a journey of 15 to 20 days without injurious effect, and that, while the frozen milk of course slowly melts and mixes with the rest, the consistency of the milk upon arrival is perfectly homogeneous and in no way to be distinguished from the fresh product.

ECONOMIC VALUE OF HUMAN LIVES

Mothers who value their babies at several million dollars each—and they all do—will take issue with Dr. V. C. Chapin, of Providence, R. I., who said at the recent convention of the American Public Health Association, held in Washington, that a baby is worth just $90. The average money value of a life of the inhabitants of the United States, he said, is $2,900. Taking the statistics, which put the net earnings to society of a human life at $300 a year, for a basis, Dr. Chapin argued that a workingman's life of 50 productive years is worth $15,000 to society. "If the man dies at 25 years of age, the loss to society is $13,000," he said, "while if he dies at 35 the loss is $10,000, and if he dies at 60 the loss is $1,000."

AUTOMATIC STEERER FOR FARM TRACTORS

An automatic steerer for farm tractors, taking the form of an outrigger and wheel, is found a great aid in plowing. The wheel of the outrigger, which is attached to the axle of the steering wheels and extends ahead of the tractor, follows the furrow last turned by the plow, and so assures the alinement of the furrows without the constant attention of the driver.



The Manner in Which the Automatic Steering Outrigger Operates

DRESSER THAT PERMITS MANY-SIDED VIEW

The New Dressing Table Which Permits a Woman to View All Sides of Her Costume at Once

In addition to looking after the well-being of their patrons in regard to comfort of both mind and body, hotel keepers are required to be alive to all forms of progress that they may be among the first to equip their rooms with time and labor-saving devices. With the object of making women guests particularly pleased to be in his hotel, the manager of a Denver hostelry has installed in all the rooms a new form of dressing table that is sure to make ladies return to his place whenever they happen to be in Denver. The type is referred to as a vanity dresser and is equipped with three mirrors which can be so adjusted that the guest not only can see how her hair looks in front, on the side and behind, but she can also tell how her skirt hangs and if her shoes match her costume, as well as get the general effect of her whole garniture. The dresser is made in several different styles of finish, but that which, its designers believe, will be the most popular, because of its dainty and attractive appearance, is white enamel with cane trimmings.

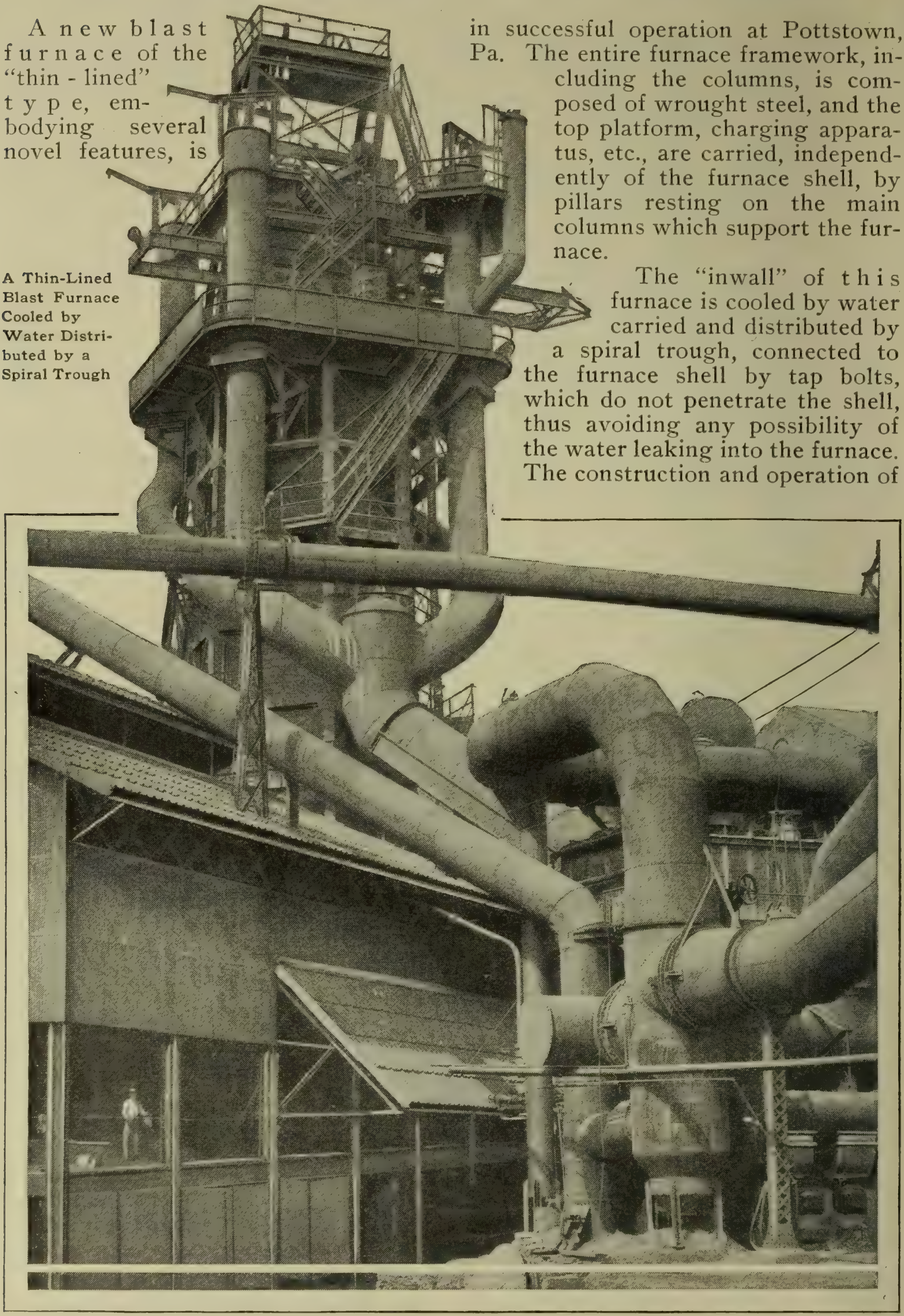
CANDIED LUMBER IS THE BEST PRESERVED

Preserving wood in sugar, actually candying it as fruit and flowers are candied, is the newest process of treating timber, just taken from the forest, to prevent dry rot and to bring about rapid seasoning. The new method was discovered by an English scientist and has since been tested with highly satisfactory results. Woods of all kinds and of all degrees of density have been subjected to test, and the sugar process has been found not only efficient but less expensive than many older methods for the same purpose. The wood is placed in tanks filled with a solution of sugar or saccharine products, the character of the solution differing for the various woods. The tanks are heated and the wood is allowed to remain for a stated length of time, which also varies with the kind and size of timber treated. The whole process, including the drying, takes but a few days and the cost, as stated, is very low.

NEW BLAST FURNACE HAS WATER COOLER

A new blast furnace of the "thin-lined" type, embodying several novel features, is in successful operation at Pottstown, Pa. The entire furnace framework, including the columns, is composed of wrought steel, and the top platform, charging apparatus, etc., are carried, independently of the furnace shell, by pillars resting on the main columns which support the furnace.

The "inwall" of this furnace is cooled by water carried and distributed by a spiral trough, connected to the furnace shell by tap bolts, which do not penetrate the shell, thus avoiding any possibility of the water leaking into the furnace. The construction and operation of



A Thin-Lined Blast Furnace Cooled by Water Distributed by a Spiral Trough

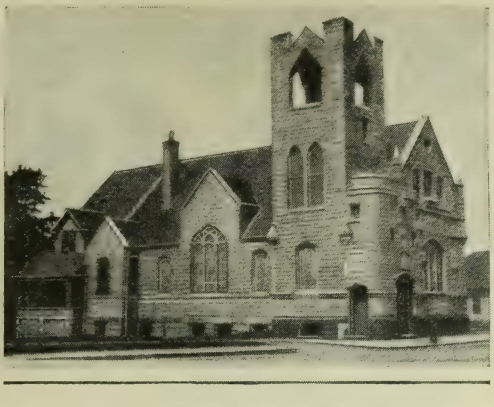
the spiral trough are such that the water is in immediate contact with the entire shell, forming a thin film over it. As a result, the effect of a well distributed spray is secured with the additional advantage that the sides of the trough prevent winds from interfering with the distribution of the water.

MEDALS FOR SUBSCRIBERS TO GERMAN AERO FUND

The people of at least two European countries are taking the question of military aviation so seriously that popular subscriptions have been and are being given for the purchase of aeroplanes for the armies. In France the people raised a large fund for the purpose and in Germany a subscription is now being taken. The Germans have popularized their work by causing to be struck a medal in two sizes, one or the other of which is given to a subscriber according to the amount of his subscription. These medals are of an artistic design and are suspended from ribbons of the national colors. For women the medals are also made in the form of brooches. The medals are sold for 12½ cents and $1.50 respectively. The wearing of the aviation medal has become quite a fad among the people.

ODDS AND ENDS USED IN BUILDING CHURCH

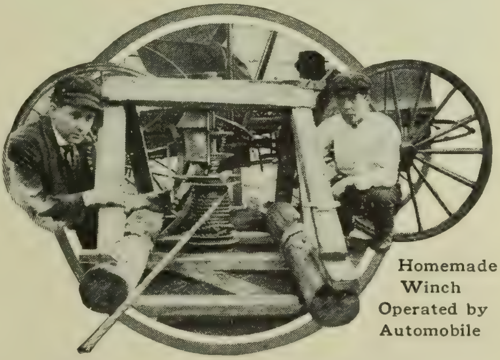
Built largely of odds and ends of material picked up here and there throughout the city, the First German Presbyterian church in Omaha is a standing monument to a persevering pastor and congregation. The dedication marked a period of two years since the first steps were taken in the erection of the strangest church in the state. Curbing stones form its foundation sill, steel street-car rails are its rafters, tiling from the roof of a wrecked railroad station now is the roof of this place of worship. There is not a single corner in the interior of the edifice, the walls at every section being rounded out to improve the acoustic properties.



Omaha Church Which is Built Largely of Odds and Ends of Second-Hand Material

HOMEMADE WINCH FOR STUMP PULLING

The men shown in this picture caused their auto car to lend its power to a winch. The drum of the winch, which is placed upright, is driven by means of a transmission gearing taken from another automobile. This gear is connected by a tumbling rod to the engine shaft of the auto car. The machinery being reversed, the drum was released and thus permitted the cable to be drawn back.



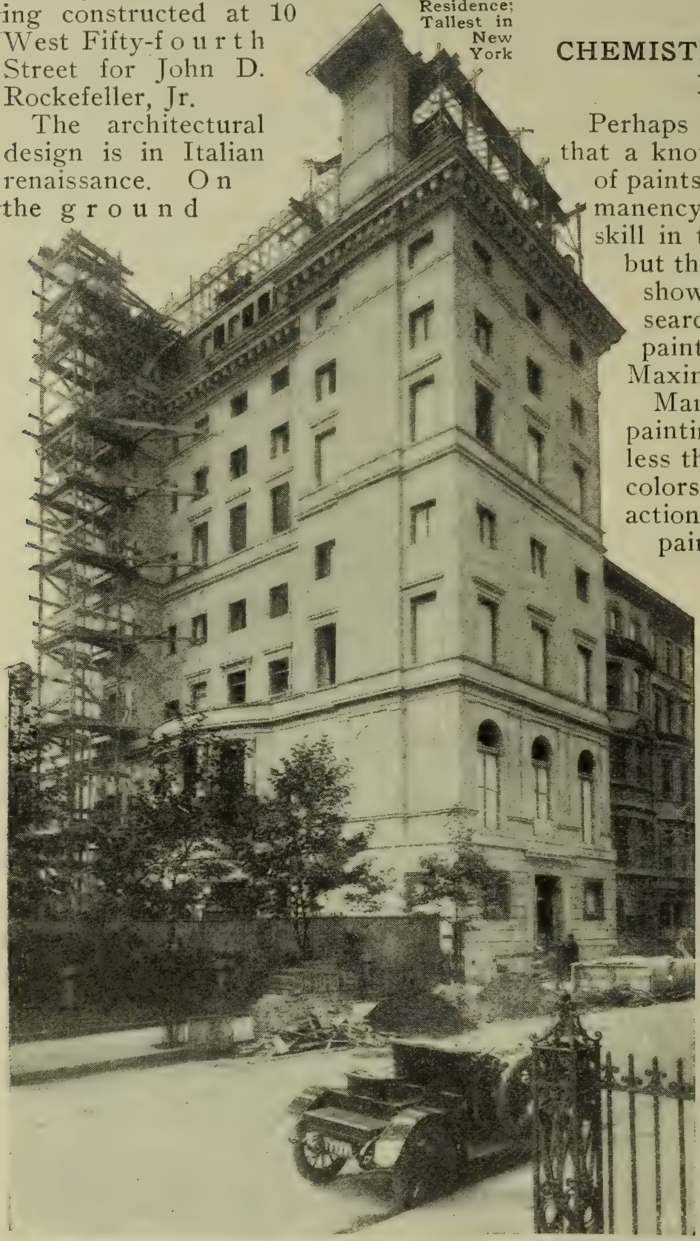
Homemade Winch Operated by Automobile

The contrivance was made to serve a variety of purposes, among others to pull out a small stump.

THE SKYSCRAPER RESIDENCE

It is not New York's tallest office building this time, that is drawing attention, but its tallest private residence, the skyscraper-mansion being constructed at 10 West Fifty-fourth Street for John D. Rockefeller, Jr.

The architectural design is in Italian renaissance. On the ground floor will be a large vestibule entrance, opening into a spacious reception room, with an office and breakfast rooms upon the same landing. The second floor will contain the drawing, music and dining rooms, and the library will be on the third floor with the owner's suite. There will be a large sun parlor on the front portion of the roof, and a glass-inclosed playground at the rear.



Rockefeller Jr's. Residence; Tallest in New York

CHEMISTRY PRINCIPLES IN PAINTING

Perhaps only few painters realize that a knowledge of the chemistry of paints is as essential to the permanency of their fame as is their skill in the art of painting itself, but that this is true was clearly shown by the results of a research on the permanency of paints recently announced by Maximilian Toch of New York.

Many of the world's greatest paintings have become worthless through a bleaching of the colors, or even by a chemical action between the different paints that were mixed to get the desired shade. Sir Joshua Reynolds, the great modern painter, experimented with the mixing of paints in order to get more permanent colors, but, since he did not understand their chemistry, he often mixed paints such as ochre and madder lake, which act chemically upon each other. In such cases the color was often changed so greatly that in time the paintings lost their original beauty.

Mr. Toch finds that some paints, such as Prussian blue, are extremely permanent, while others, carnation lake, for instance, lose all of their color by exposure to light. He cites two paintings by Sir Joshua Reynolds, in which paints of these two classes were used. In one, the paints have bleached so easily that what was once the portrait of a handsome woman, has now become a faded mass of color. The face, throat, and fur trimming on the dress are all reduced to the same tone and almost to the same color value, and the lips show so little color that they have almost disappeared. The other is a painting of a child, whose lips are still a bright red, and the colors on the whole so well preserved that it is still a very beautiful painting.

Not only do certain paints fade in the light, but Mr. Toch finds that others, which are not affected by light, are changed by the action of sulphur fumes which are so prevalent in the smoke of cities. This is true of chrome yellow, chrome green, Paris green, Prussian blue, and many others.

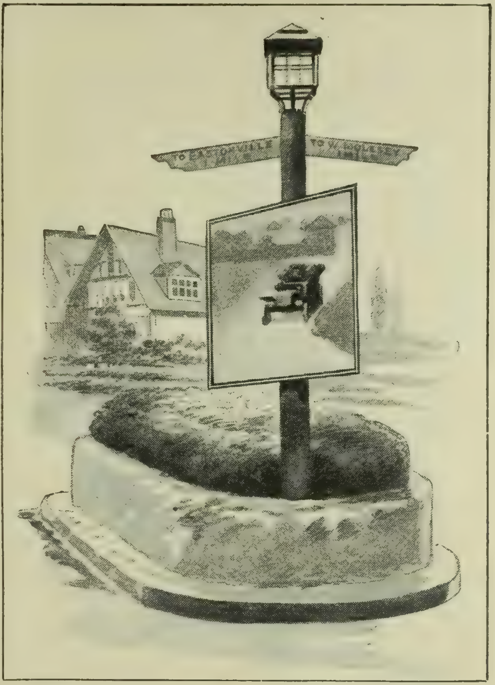
ROTARY FILE OPERATING LIKE EMERY WHEEL

Rotary files, made in sizes from 1/4 in. to any diameter desired to meet individual requirements, and mounted on stands as emery wheels are now being manufactured. The circular file, which has teeth cut on both sides, is rotated at a speed of 200 revolutions per minute, the material to be surfaced or filed being held against it. The tool is especially intended for filing solder, babbitt, aluminum, and other soft metals.

Rotary File for Surfacing Soft Metals

MIRROR ON SIGNPOST AS ACCIDENT PREVENTION

The policy of locating mirrors at dangerous corners, so that traffic approaching the corner from one direction may see that approaching from the other, is becoming quite general in England. In the illustration is shown a 3-ft. mirror placed on a signpost at a dangerous turn at Beckenham, in Kent. Some of the towns have many dangerous turns, and are erecting mirrors at each.



Mirror Erected on Signpost at Dangerous Turn in an English Village for the Purpose of Preventing Collisions

FIRE EXTINGUISHER THAT SMOTHERS FLAME

A peculiar fire extinguisher which creates a noncombustible gas and smothers a fire by depriving it of oxygen is the newest development in fire-fighting apparatus. The extinguisher is contained in a double-acting pump and the fluid is of such a composition that it has been used with remarkable success on electric or oil fires, which defy any substance containing water.

The liquid used has a high specific gravity, a low boiling point, is organic in composition, contains no acid or alkali, salts or moisture, and is classed as a nonelectrolyte. It can be used, therefore, to extinguish an electric arc without endangering the person using it by a flow of the current through the extinguisher itself, as is the case with water and many other liquids used for putting out ordinary fires. The pump, being double-acting, discharges its contents continuously both on the forward and return stroke of the piston until the reservoir is exhausted.

New Fire Extinguisher for Household Use, Especially for Oil or Electric Blazes

ℭThe Swiss Alpine Club has 75 refuge huts located at important points in the mountains. In 1911, more than 40,000 climbers registered at these refuges. More than 2,600 climbers used the refuges located at altitudes above 10,000 ft.

DAYLIGHT TRAINS BETWEEN CHICAGO AND THE WEST

One of the railroad systems operating passenger trains between Chicago and the Pacific coast is to put on schedule a special "daylight" train for tourists as an experiment. The first of these trains will leave early in February, and will be followed at intervals during the tourist season, such a train leaving three times a week, or even oftener, if the traveling public takes to the idea of "sunrise to sunset" journeying.

The train will be made up entirely of sleeping cars of the compartment and drawing-room type, no ordinary berth cars being carried; and dining and observation cars. The number of passengers will be limited, and the train service will include stenographers, maids, valets and barbers.

The fact that the train will be run only through the day, will give the passengers an opportunity to see every mile of scenery of the entire journey. The night stops of the train will be in quiet places, so that the passengers may sleep in peace.

MOST NORTHERLY AMERICAN ELECTRIC-LIGHT PLANT

An electric-lighting plant at St. Anthony, Newfoundland, about 50 miles south of the Straits of Belle Isle, is probably farther north than any other on North American territory. The plant is a small one used for lighting the buildings and grounds of the Royal National Mission to Deep Sea Fishermen, at the head of which is Dr. Wilfred T. Grenfell, who has achieved a wide reputation for his work among the Labrador fishermen. The buildings lighted are the hospital, orphanage, guest house, director's residence, besides several tenements and smaller structures. About 400 incandescent lamps are in service. The plant is operated from 8 to 11 p. m. in summer and from 4 to 8 a. m. and 4 to 11 p. m. in winter, the winter nights being long in that high latitude.

THE WONDERS OF LIGHT

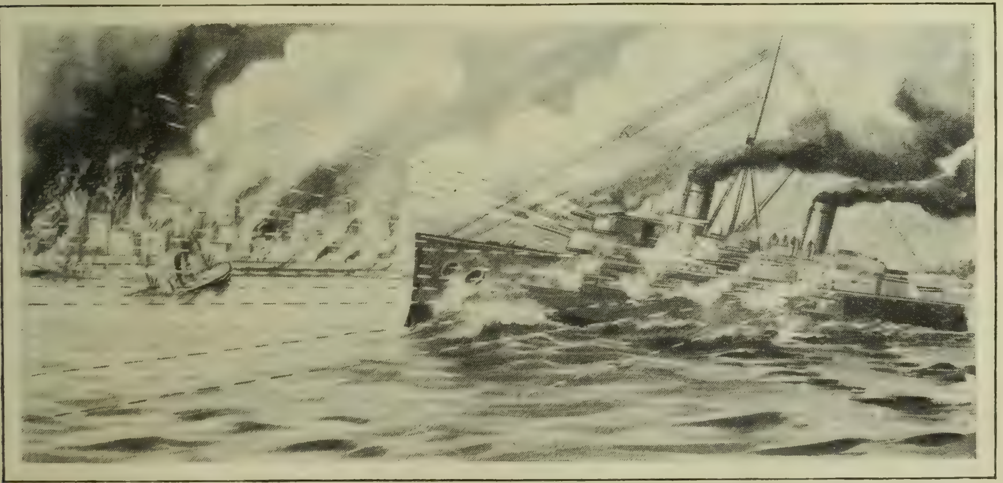
By J. GORDON OGDEN, Ph. D.

X—The Flying Electrons

WERE an ordinary battleship to drop anchor in New York Harbor, only a passing interest would be excited. Suppose, however, that this battleship were not ordinary. Suppose that it kept up a constant bombardment, shooting forth cannon balls and shells whose velocity was 40,000 times that of a rifle bullet. Suppose that it shot out a continual fire of smaller projectiles moving with the enormous speed of 175,000 miles a second. Suppose that these smaller missiles when they struck gave forth deadly lances of X-rays, that penetrated rock and stone, wood and iron, flesh and bone, riddling everything with their invisible, death-dealing vibrations. Suppose that this strange ship emitted a wonderful gas that enveloped and clung to every substance it touched within a radius of many miles. Suppose that the whole interior of the ship were the scene of an extraordinary movement of cannon balls moving with frightful speed, backward and forward, within the iron walls of the vessel. Lastly, suppose that every human being within hailing distance of this wonderful ship would be totally or partially paralyzed, blinded, or burnt to death. What would the world think of this dreadful, frightful nightmare? Every man, woman, and child on the globe would be profoundly interested in this new engine of destruction. Armies would be hastily mobilized. Men of science would meet in frightened conclave. The editors of the big dailies would send hundreds of skilled reporters to get the "story" of the most wonderful thing that had ever happened in the history of the world.

There is just such a battleship. Yea, there are untold billions of them, but fortunately for mankind, they are infinitely smaller than an ordinary warship. In fact, they are so small that a whole navy of them could find room to maneuver on the head of a pin! These tiny ships are otherwise known as atoms of radium. Were an atom of radium to be increased to the size of a battleship and retain, proportionately, its wonderful powers, it would do all and even more than was predicated of the battleship spoken of in the beginning of this chapter.

And what, asks the reader of these stories on the Wonders of Light, has



Like a Battleship Raining Projectiles at Enormous Velocity in Every Direction, Destroying Everything in Its Neighborhood, is, Comparatively a Bit of Radium with Its Flying Particles all this to do with light? Simply this: if we read aright the story that radium has to tell, we are not only very near to the solution of the mystery of light and color, but also of those other marvels, heat, electricity, and magnetism! Before we can realize the reasonableness of this rather startling statement, let us review, briefly, the history of the discovery of radium, and of the curious, wonderful phenomena that have finally put science hot on the trail of some of the most elusive mysteries in the universe.

When Röntgen startled the world, in 1895, with his discovery of the X-rays, every scientist turned his attention to this new field of development. Every detail of the original experiment was scrutinized most sharply for some information that might lead to an adequate explanation. A Frenchman, M. Poncairé, calling attention to the fluorescence attendant upon the production of X-rays, suggested that there might be some close connection between them and fluorescence. This suggestion was immediately acted upon by a Russian scientist, Niewengloski. He wrapped a photographic plate in black paper and placed on top of it a small square glass. On the glass he put a few grains of a substance known as calcium sulphide, which has the peculiar power of phosphorescence. We are all familiar with phosphorescence, such as is produced when an ordinary match is rubbed on the palm of the hand in the dark. The next day the plate was developed, and a clearly defined image of the glass rewarded the query of the investigator. Something had affected the photographic plate and this something was not the X-rays, as the straight edges of the glass had bent the rays (refracted is the correct term), and it is known that X-rays cannot be bent in this way. Here was something new.

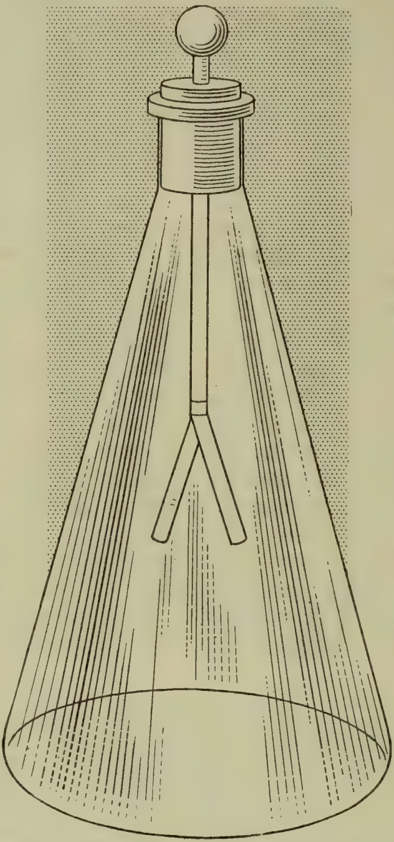


Fig. 1—Most Sensitive Scientific Instrument Known, a Gold-Leaf Electroscope, the Bits of Gold Leaf Flying Apart When Affected by Electricity

Then came M. Becquerel who set about investigating these "X-rays" that were not X-rays. He knew that any substance containing uranium, a well-known element, has the power to cause fluorescence. He therefore exposed a bit of pitchblende, a complex mineral containing, among other things, a little uranium, to the sunlight, and found that it, too, would affect a photographic plate, just as the calcium sulphide had. He performed this experiment a number of times, but always exposed the blende to the action of direct sunlight before he brought it into contact with the sensitive plate. One day it chanced that, just as he was about to repeat the experiment, a cloud obscured the sun. Not caring to wait until the sunlight would become strong again, he carelessly thrust the plate, with a small metal key on top of it, into a dark drawer together with some crystals of uranium salts. A few days later he happened upon the plate and developed it. To his intense astonishment there was an image of the key distinctly marked upon it. It flashed upon him that the uranium salt possibly possessed a hitherto unknown property, and that the previous exposures of the blende to the action of the sunlight had nothing whatever to do with this property. He therefore procured a large number of uranium salts, and found that they all possessed the property of affecting a photographic plate. One very important fact did not escape his attention, viz., that pitchblende was even more powerful than pure uranium in producing an effect upon a sensitive plate. This was a very strong hint. There must be something in the blende that was even more potent than any combination of minerals that had yet been tried. Then the world began its search for this wonderful something.

The rays that produced these phenomena were called the "Becquerel" rays, and it was soon learned that they had the power to discharge or neutralize a body that had been electrically charged.

Now, in order to understand what followed the announcement of this fact, it will be necessary for us to call to mind a bit of simple apparatus with which we are all more or less familiar, or can easily understand. An olive bottle, a cork, a bit of copper wire, and a slip of gold leaf, and behold, we have a gold-leaf electroscope, the most sensitive instrument known to science. Just how sensitive it is, may be realized by comparing it with another sensitive instrument, a spectroscope, mention of which has been made in the earlier chapters of these articles on light. A good spectroscope will detect, unerringly, the one sixty-fifth of one millionth of a grain of the element sodium. An electroscope, as shown in Fig. 1, is a million times more sensitive than a spectroscope!

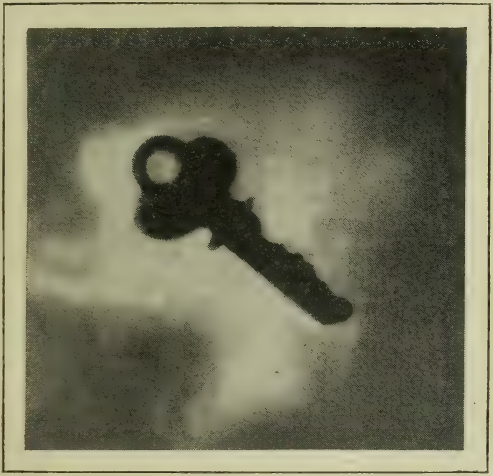


Fig. 2 —Impression of a Door Key on a Photographic Plate Taken by Means of Some Uranium, after the Manner in Which Becquerel Discovered the "Becquerel Rays"

What is the action of an electroscope? If a rubber comb is rubbed briskly on the coat sleeve and brought near to a gold-leaf electroscope, the gold leaves will instantly fly apart, and remain that way until the exciting influence is removed. If the wire is touched, the leaves, being charged with one of the two kinds of electricity, remain apart for a considerable time. Why? Because the leaves are charged with only one kind of electricity, and it has been observed, millions of times, both by scientists and amateurs, that like charges of electricity, whether they be positive or negative, repel each other.

When we bring X-rays near to a charged electroscope, the leaves collapse, and the same thing was found to be true of the mysterious Becquerel rays. Here again was another important finger post, pointing out the way to the detection of the wonderful something hidden within the blende.

The next and last step was made by a woman, Mme. Curie. Intensely interested in the work of Becquerel, she began to study most eagerly the components of pitchblende. The Austrian government placed at her disposal the tailings left from the pitchblende that had been used in the extraction of uranium. It is uranium that gives the beautiful greenish-yellow hue to Bohemian glass. In a short time she discovered a new element, polonium, so named for her native Poland. Polonium, she found, is more powerful than uranium in its effect upon a sensitive plate and upon a charged gold-leaf electroscope. She was convinced, however, that there was still another substance, even more elusive, even more powerful, within the blende. Finally, in conjunction with her husband, the late Professor Curie, she discovered the most interesting of the eighty odd chemical elements, and christened it, by a happy inspiration, radium! What joy must have been hers in contemplating the fruit of her labors, a mere speck of white powder, resembling common salt in appearance, but unlike it, emitting a feeble light in the dark. And this mere speck had 1,800,000 times the radioactive power of the uranium ore from which she had extracted it!

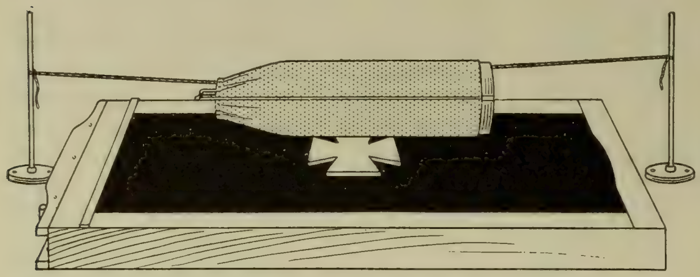


Fig. 3—Apparatus for Taking a Picture by Means of Thorium, an Ordinary Welsbach Mantle Which Contains Thorium being Held for a Week over a Sensitive Plate Covered with a Hard-Rubber Shield, on Which Lies a Metal Cross

The methods used by Mme. Curie in separating the radium salt from blende were exceedingly complicated, and involved a series of wearisome solutions and crystallizations, extending over a period of many months. There is less radium in pitchblende, its richest ore, than there is gold in sea water.

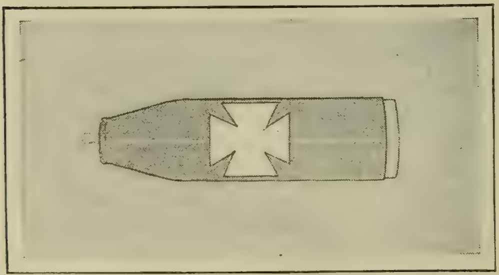


Fig. 4—The Photograph Obtained from Thorium; the Flying Electrons Pierced a Hard-Rubber Plate and Bombarded the Sensitive Photographic Plate Beneath, Making a Picture of the Mantle and Cross

What a tremendous excitement a few thimblefuls of white powder, for that is all that there is of it today, have caused! And what is this remarkable substance? Is it really any more remarkable than iron, or copper, or gold? Not in the least. It gains its spectacular reputation from the fact that it is decaying, or breaking up more rapidly than all other metals. It is to iron what a fast express is to a canal boat. It is a cinematograph film as compared with the dim old portraits that adorn our library walls.

Scientists have subjected radium to the crucial "third degree" and have learned that its life is about 2,500 years, while that of uranium, its next-door neighbor, is 7,500 million years! Quite a difference? When we speak of the "life" of a metal, what is meant? Let radium give the answer. This curious silvery metal is a most brilliant story-teller of the most bewildering tales that mother nature keeps for her interested children. Briefly, the story of radium as told by itself is as follows:

"I am called a metal and an element. Whether I really am either of these, I shall not say, as I do not care to enter into a discussion as to the meaning of these terms. At any rate, I was once known as uranium, and some day, not so far off, I shall be known by the name of lead. I am in a transitional stage and am constantly sending forth to the world at least four different kinds of messages—messages made up of my own substance, if substance it may be called. Scientists have come to a knowledge, very slight, I must confess, of these messages, and have tabulated three of them, under the first three letters of the Greek alphabet: Alpha, Beta, and Gamma. My Alpha-rays are simply charges of positive electricity; each of them is about twice the size of an hydrogen atom and moves through space at the rate of 15,000 miles per second. My Beta-rays are about 1/1,000 the size of an hydrogen atom. (The hydrogen atom, before my advent into the world of science, was considered to be the smallest thing in the universe.) My Beta-rays move with a velocity nearly equal to that of light, and are nothing more nor less than charges of negative electricity. I greatly prefer the name of 'electrons' for these Beta-rays, as that name seems simpler and better than any other as yet suggested. My third kind of rays, known as the Gamma-rays, are produced when the Beta-rays, or flying electrons, are stopped in their wild flight. They produce a peculiar, penetrating pulse in the great ether ocean, and are really the well-known X-rays with which science has become quite familiar in the past 17 years. The other message I send forth, and I do not, by any means, say that these four are the only phenomena I produce, is very much like a gas; it is known as the 'emanation,' and characteristically renders everything with which it comes in contact highly radioactive, that is, just like myself.

"At present I am the most sought-after, and the most valuable thing in the world. There is only a fraction of a pound of myself at large, and, if I except a tiny mite set free by Mme. Curie a few months ago, I am not wholly free, as I am in bondage with two other elements known as chlorine and bromine.

"Just a microscopic speck of me, so small that it is barely visible to the naked eye, is worth $5,000, and I am told that a pound would cost the tidy sum of $100,000,000! I am a veritable mine of energy. One single pound is the energy-equivalent of 1,500,000 tons of coal, and would be amply sufficient to propel a battleship of 15,000 tons for 30 years at the rate of 15 miles an hour."

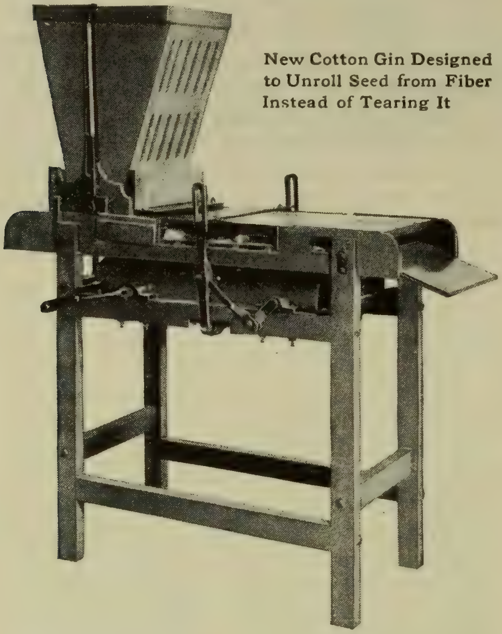
Among all the wonderful things that radium has told us of, surely the most wonderful are the "flying electrons," otherwise known as the Beta-rays. These electrons are not confined to radium, but are probably the basic constituents of all matter. It is the movement of these tiny particles of negative electricity that causes an electric current. It is their surging to and fro in an upright wire that causes the wave splashes in the ether that are responsible for the wonders of wireless telegraphy!

The 80 substances known as elements are simply congregations of electrons, the heavier elements, such as platinum and gold, having a greater number of electrons than those of less density, such as sodium and lithium. When these flying electrons march steadily in the same direction around a bar of iron, they transform it into that curious thing known as a magnet. It is quite probable that the rapid motion of the electrons around atoms produces certain disturbances in the ether that are the direct cause of light waves. Each atom is like a sun with its system of planets, and is every bit as wonderful. Even as the planets move around the sun with different velocities, varying with their respective distances from their controlling luminary, so do the flying electrons move about the atoms of which they are the satellites. In this manner all the countless myriads of wave lengths are produced, ranging from the long waves of radiant heat, through the shorter wave lengths that produce the crimson, gold, and lavender of a sunrise, up to the tiny actinic waves that enable the plant kingdom, from a stately forest tree to a blade of grass, to set up countless billions of laboratories for the manufacture of the food supply of the world, which must be replenished constantly.

Some day, we shall know more of these things and the utilization of the vast stores of energy, hitherto unsuspected, that surround us. Some day, our descendants will extract, from a few common pebbles, more energy than we at present get from a mountain of coal or a river of oil. Some day, our homes will be lighted and heated, our mills actuated, our steamers propelled across mighty oceans, our airships driven through sunlit skies, by the wonderful interatomic forces that are just barely hinted at in the strange messages we receive from the "Flying Electrons."

GIN TO UNROLL SEED FROM COTTON FIBER

Members of the New Orleans cotton exchange, and others interested, recently inspected the working of a new cotton gin which some cotton men declare will revolutionize the cotton industry. The gin is the invention of a Parisian, who has been residing in New Orleans for several years. The salient feature of the new gin is that the seed is unrolled from the cotton fiber, leaving the latter uninjured. In ordinary ginning the fiber is more or less torn, and as the length of the fiber is of the greatest consideration in determining the quality of the staple, the new device is expected to enhance the value of cotton so ginned as compared with that ginned with the present type of gin. Cotton men declare that torn fiber cotton is worth from half a cent to one cent a pound less than cotton with the fiber uninjured.



New Cotton Gin Designed to Unroll Seed from Fiber Instead of Tearing It

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ℭLloyds, the famous English board which insures pretty near everything under the sun, has issued policies insuring the lives of 12 performing chimpanzees.

NEW WAY TO DISTINGUISH POISONS

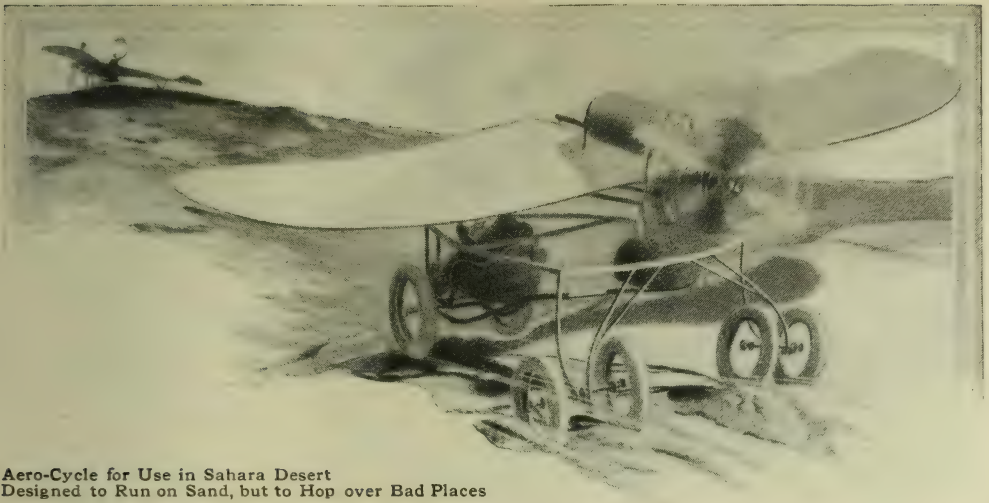
An interesting new method of distinguishing between poisonous substances has just been announced by Gustave Michaud, of the Costa Rica State College. If a photograph is taken of samples of morphine, strychnine, caffeine (a constituent of coffee), and digitalin, all belonging to the so-called alkaloid poisons, these substances appear white in the photograph, except digitalin. But if the photograph is made by the use of ultraviolet light instead of ordinary light, the caffeine would appear white, the morphine gray, and the strychnine black.

This phenomenon seems to be of the same nature as others previously described in this magazine, in which animal matter and minerals of different kinds, when viewed in ultraviolet light, assume distinctive colors.

INDIAN LOOKOUT WATCHING FOR FISH SCHOOL

Indians profited by the abundance of fish in Puget Sound waters ages before white men came to the "Oregon Country." Not only did they catch the salmon which 30 years ago sometimes during the spawning season filled the small streams from bank to bank, but appreciated the luscious smelt that

Puget Sound Indian on Lookout for School of Fish



Aero-Cycle for Use in Sahara Desert
Designed to Run on Sand, but to Hop over Bad Places

were found in season in the bays. For many years the "lookout" has been in use for detecting the presence of smelt and herring. This Indian was caught as he was on the watch. His elevation gives him the same advantage that the kingfisher has as he hovers over the water seeking his prey. Whenever a school of fish is seen he hurries into his boat and soon has it surrounded with his fine-meshed seine.

LONDON AIDS CHILDREN IN SEARCH OF WORK

The London County Council has recently established bureaus throughout the metropolis where boys and girls, and their parents, may apply for advice and information relating to the employment of children. Special consideration is given each applicant and the endeavor is made to find for each a trade or occupation suited to his qualifications, judged from the standpoint of education, and physical and mental equipment. In filling vacancies, all the circumstances and facts in connection with the applicant's school and home life are considered, and the consent of parents is, of course, required in each case. The bureaus work in conjunction with the 21 labor exchanges of London.

SIX-WHEELED AERO-CYCLE FOR SAHARA DESERT

A curious six-wheeled vehicle, driven by an aerial propeller, has been devised by a corporal of the engineering corps of the French army as a rescue outfit for aeroplanes stranded in the Sahara desert.

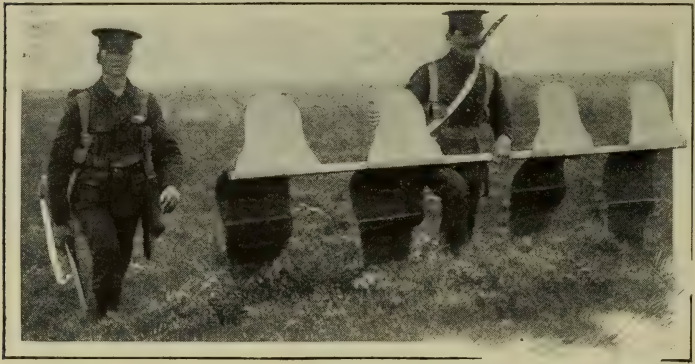
The French have for some time been experimenting with the idea of traversing the Sahara with aeroplanes, and several of the military airmen have penetrated for various distances. One of the problems of Sahara aviation is the provision of some means whereby assistance could be rapidly carried to a stranded airman, and it is for this purpose the curious vehicle is designed.

The triangular frame of the aerocycle is supported at each corner by a two-wheeled truck. By an ingenious arrangement each wheel can displace itself along an axis perpendicular to the line of running so that the total weight of the machine, which is not more than 700 lb., is equally distributed upon all six wheels. The engineers are now testing planes on it for hopping bad spots.

¶ Friction lamp lighters for automobile headlights are now being marketed. The pulling of a little chain turns on the gas and lights it with a spark.

DUMMIES DRAW FIRE OF ATTACKING ARMY

The device shown in the accompanying illustration was employed recently during a mimic battle engaged in by British soldiers on Longmoor, an ideal location for a conflict, sham or real. With the enemy's attention concentrated on this device, so constructed that, at a distance, the resemblance to approaching soldiers is striking, opportunity was afforded the opposing side to execute attacks from the flank and rear.



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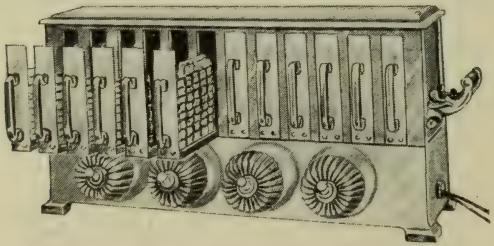
This Contrivance Deceives the Enemy into Believing the Uprights are Soldiers

ELECTRIC TOASTER OF LARGE CAPACITY

An electric toaster of large capacity, especially designed for hotels and restaurants, is here shown. It has 12 toasting drawers so controlled that any three of them may be used without heating the entire series. This toaster is capable of producing 720 full-sized slices of toast per hour.



An Electric Toaster Which Turns Out 720 Slices of Toast per Hour

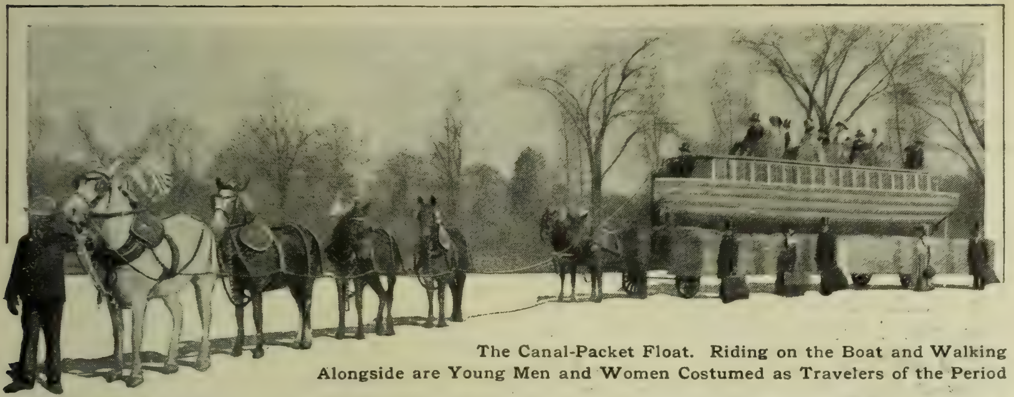
FLIES CARRY INFANTILE PARALYSIS

Infantile paralysis, the exact cause and the methods of transmission of which has hitherto baffled physicians, may be carried by the stable fly, according to Prof. M. J. Rosenau, of Harvard University. He has apparently succeeded in transmitting this fatal disease from sick to well monkeys by the bite of the common stable fly. He allowed a number of these flies to bite monkeys in various stages of the disease, and then later allowed them to bite 12 well monkeys. Of the latter, six became ill with well-marked symptoms of infantile paralysis, and three died.

The stable, or biting fly, usually found around and in stables, is, however, not uncommon in houses. It bites animals as well as men, and sucks their blood, upon which it feeds. Professor Rosenau concludes that after the virus is taken into the body of the fly by biting an infected animal or person, some time must elapse before the fly is capable of transmitting the disease, but that the period is probably less than 21 days.

TUNGSTEN LAMPS SURVIVE SHIPWRECK

One of the most strenuous unpremeditated tests of the highest-grade tungsten lamps resulted through the sinking of the P. and O. liner "Oceana" some time ago. The salvage operations on this vessel have resulted in the recovery, among other things, of cases containing 600 tungsten lamps. Of the five hundred 24-watt, 100-volt lamps contained in these cases, only 22, or 4.4 per cent, were broken, and only two of the one hundred 25-watt, 55-volt lamps, the remainder being returned to the lamp concern in perfect condition.



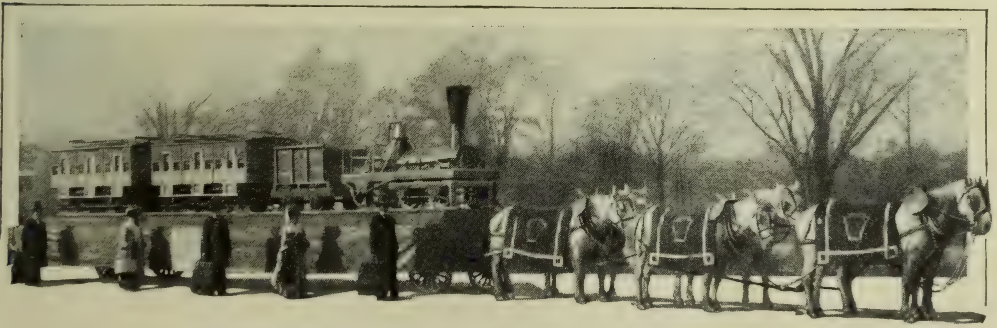
The Canal-Packet Float. Riding on the Boat and Walking Alongside are Young Men and Women Costumed as Travelers of the Period

A PAGEANT OF EARLY TRANSPORTATION

A pageant of early railway and canal "packet" transportation in Pennsylvania was held recently in Altoona in connection with the Semi-Centennial of the Loyal War Governor's Conference, which convened Sept. 24, 1862. On one of the floats of the pageant was a reproduction of the locomotive "Lancaster" and train. The "Lancaster" was placed in service in 1834, was first used in hauling material for the completion of the Philadelphia and Columbia railroad, and then drew the leading passenger train from Columbia to Philadelphia on the formal opening of the road. This locomotive weighed eight tons, had a capacity of drawing 56 gross tons, and moved its train at a speed of a little more than nine miles an hour. The two cars on the float were reproductions of the original cars, which were constructed to be drawn by horses, and were then modified to adapt them to the locomotive.

On another float was shown a faithful reproduction of the passenger boats used on the Pennsylvania Canal in 1836 in connection with the railroad. These packets, drawn by three mules, were 72 ft. long, by 11 ft. wide, and 8 ft. high. The interiors were divided into four compartments, a mule stable, always occupied by three mules; a kitchen, a gentlemen's cabin and a ladies' cabin. Swinging sleeping berths were fastened along the sides of the cabins, and were separated by curtains. These boats each accommodated about 150 passengers.

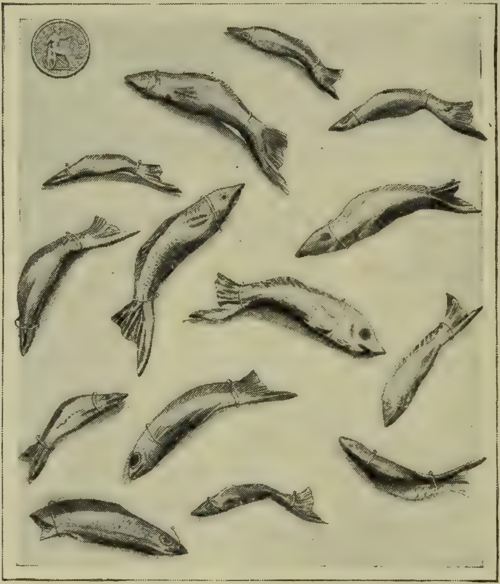
The trip from Philadelphia to Pittsburgh, by railroad and canal packet, took 4½ days. The original poster advertising the opening of this route said: "Passengers by this line will be carried through to Pittsburg as soon as any line now running by the above route, passing over the Rail-Roads with daylight. The cars on the Philadel-



The Locomotive "Lancaster" and Train of Two Passenger Coaches. Travelers with Carpetbags Walking Alongside phia, Columbus, and Portage Rail-Roads are of the best description and the accommodations in the Packet Boats are equal to any, each having a Gentlemen's and Ladies' Cabin, fitted up with comfortable berths."

FISH CARVED FROM FISHBONES

The fish shown in the accompanying illustration came from the deep sea, but not in the form in which they were photographed. They are the handiwork of an old and patient fisherman of Deal, England, who carved them with his clasp knife from the bones of his varied catches.



Counterfeits of the Finny Tribe Carved from Fishbones

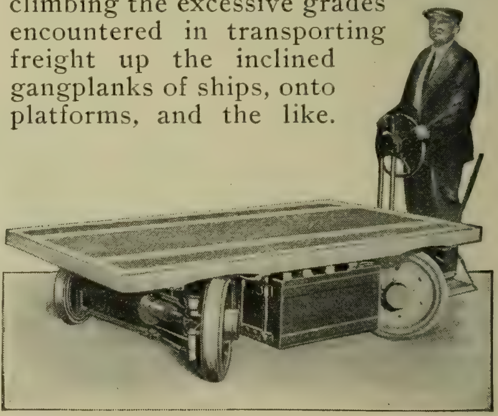
EXPERTS DESIGN MAGAZINE FOR HIGH EXPLOSIVES

The Bureau of Mines has just completed experiments with magazines for the storage of explosives and has compiled data which have been reduced to a design for a magazine that, the experts think, will give the least trouble in case of fire or attack by an armed force, and at the same time preserve the explosives in an excellent state. The structure is a building of reinforced concrete, 10 by 14 ft., and can be built at a cost of $400. The roof, walls, floor and door are all made of cement. The roof is further covered with galvanized iron. The walls are 6 in. thick and the cement roof and door are 3 in. thick. The door is of the sliding type and the construction of the place makes it particularly safe against fire. The walls resist the penetration of bullets, it is stated, and because of the friable nature of the material in case of an explosion in or near the magazine no large masses of material will be hurled into the air. The building is designed to have a capacity of from 20,000 to 30,000 lb. of explosive. It is protected from lightning through the four corners being grounded with metal rods and connected with the galvanized-iron roof.

ELECTRIC BAGGAGE AND PACKAGE TRUCKS

An electric truck designed solely for use in the baggage and freight sheds of railroads, on steamship docks, and in factories, warehouses, and like places where much package goods is handled, is finding favor in the motor world.

The electric truck has a single motor, receiving current from a storage battery, and all four wheels are both driving and steering wheels. This four-wheeled drive is claimed to give the exceptional traction necessary for climbing the excessive grades encountered in transporting freight up the inclined gangplanks of ships, onto platforms, and the like.



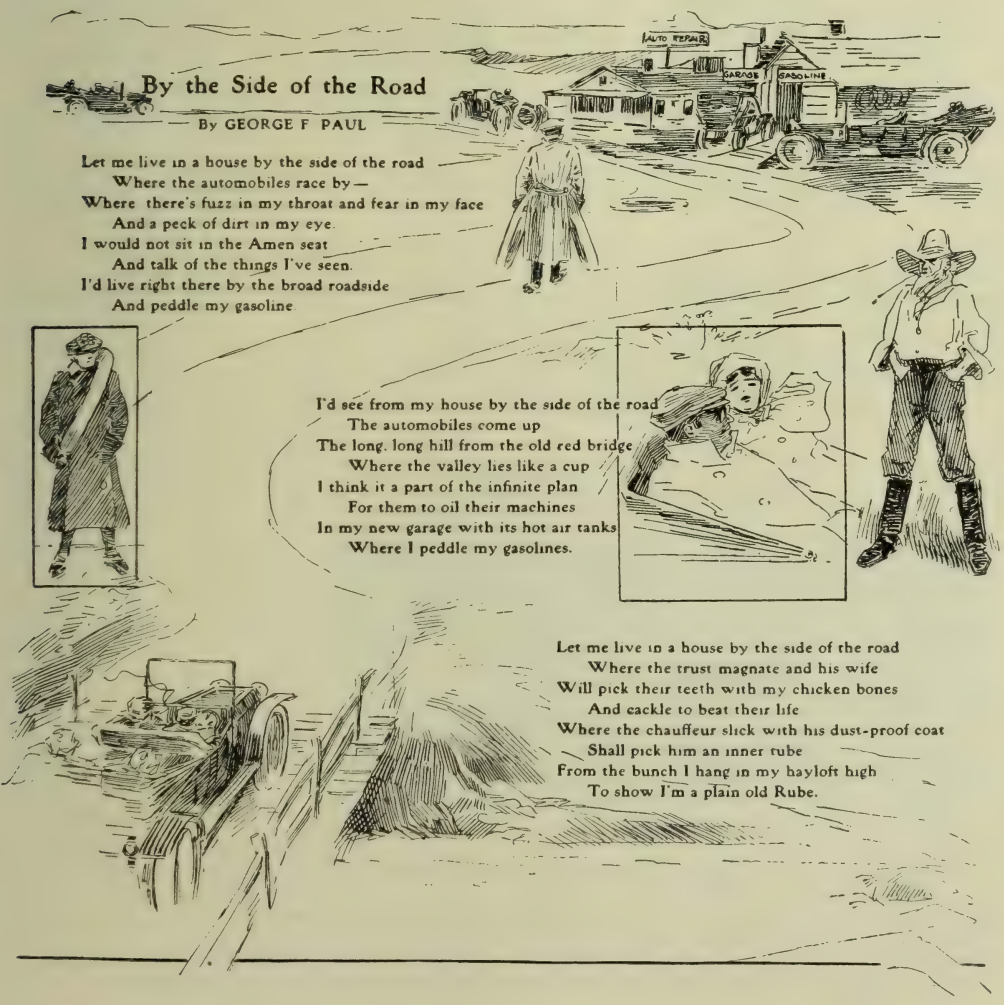
An Electric Baggage and Freight Truck

The four-wheel transmission is effected by means of two propeller shafts, coupled by means of universal joints to the ends of the armature shaft. The propeller shafts drive live axles of the type commonly used in motor-car practice. The operator stands on a step at the back of the truck.

HOW TO GROW TALLER

In these advanced days in medicine and surgery, it would seem that one need only consult one of these scientists to attain almost any desired physique. It is reported that an English surgeon increased the height of a young man two inches in two months by giving him extract of the thyroid gland of sheep. This is the gland in the neck which, when enlarged, is called a goiter, and its function within the human system is to regulate the growth of the long bones. When it is overstimulated in a youth, he may grow up a giant. Insufficient secretion causes dwarfs or cretins.

By feeding young dogs on thyroid secretion, beginning with one dog of the same litter the first month, another the second month, and so on, a series of dogs of perfectly graduated sizes may be produced.



By the Side of the Road

By GEORGE F PAUL

Let me live in a house by the side of the road
Where the automobiles race by—
Where there's fuzz in my throat and fear in my face
And a peck of dirt in my eye.
I would not sit in the Amen seat
And talk of the things I've seen.
I'd live right there by the broad roadside
And peddle my gasoline

I'd see from my house by the side of the road
The automobiles come up
The long, long hill from the old red bridge
Where the valley lies like a cup
I think it a part of the infinite plan
For them to oil their machines
In my new garage with its hot air tanks
Where I peddle my gasolines.

Let me live in a house by the side of the road
Where the trust magnate and his wife
Will pick their teeth with my chicken bones
And cackle to beat their life
Where the chauffeur slick with his dust-proof coat
Shall pick him an inner tube
From the bunch I hang in my hayloft high
To show I'm a plain old Rube.

By Means of Bristles on Arrows and a Target of Bristles, Home Archery is Made Safe

BRISTLE-ARCHERY FOR INDOOR PLAY

Indoor archery is made interesting as well as practical by means of a special target and arrows, the important feature of which is the "bristles." That is, the arrows have bristle heads, and the target presents a bristled face to the players. The bristles are made of so-called Tampico fiber, which comes from Mexico.

In playing the game, the target is arranged on a table at one end of the room, or it may be hung on a wall, with a protecting shield of some nature around it, to keep the wall paper from possible soiling, and the players stand at the other end. The arrows are shot from bows, and, on striking the target, stick where they hit, due to the fact that the bristles of the arrow become entangled with the bristles of the target, in the same manner that a pair of hair brushes may be held together by lightly forcing the bristles of one into the other. The arrow heads being soft, there is no danger in playing the game.

ELECTRIC GONDOLA FOR THE THOUSAND ISLANDS

A beautiful electrically propelled gondola, built in strict accordance with all the technical traditions of the Venetian builders of the past centuries, is used by Commodore F. G. Boure, of the New York Yacht Club, at his home in the Thousand Islands, in the St. Lawrence River.

The Beautiful Electric Gondola Constructed for the Commodore of the New York Yacht Club

In workmanship, the boat is probably one of the handsomest pleasure craft turned out in this country. It is constructed of Indian teak and African mahogany, and the entire exterior of the "felsi" or cabin is handcarved. The interior of the cabin is luxuriously upholstered, even the ceiling being paneled in leather, the irons, or "ferri," which decorate the bow and stern, are exact reproductions of those shown in old prints of gondolas built in the eleventh century, and the highly ornamental rowlocks, or "forcoles," which represent sea horses, are of bronze mounted on carved-teak bases.

The gondola is 40 ft. long, and is equipped with an electric motor and storage batteries, which give it a speed of 7½ miles an hour. The power plant is so skillfully concealed that the boat, silently gliding along, seems propelled by a ghostly gondolier.

PROTEST AGAINST ESKIMO CIVILIZATION

Fearing the extinction from measles and other contagious diseases of the blonde-haired Eskimo tribe discovered in the Coronation Gulf region of Canada, Vilhjalmur Stefansson, their discoverer, is attempting to induce the Canadian government to issue a proclamation of perpetual quarantine of the whole district. He desires to keep all kinds of civilization, including religion, with its creeds and institutions, away from them.

"Whenever a new people is discovered," the explorer says, "the commercial men want to know of the possibilities of the surroundings. In this case they want to know whether or not there are possibilities of bringing more furs into the markets of the world. The church, on the other hand, wants to know whether it can save the souls of the new people. No one cares for the people themselves, or whether, in the course of the coming of commerce and religion, these people may be exterminated."

¶An enterprising French peddler has enlisted the automobile in his scheme of rapidly disposing of his stock in trade, which consists of out-of-style hats, bought up from the large Parisian millinery establishments. He tours the country in his automobile, stopping only at out-of-the-way villages and small towns, where the inhabitants are not well posted on the frequent changes in Parisian fashions and buy his wares.

TOE DANCER PRACTICES WITH LAWN ROLLER

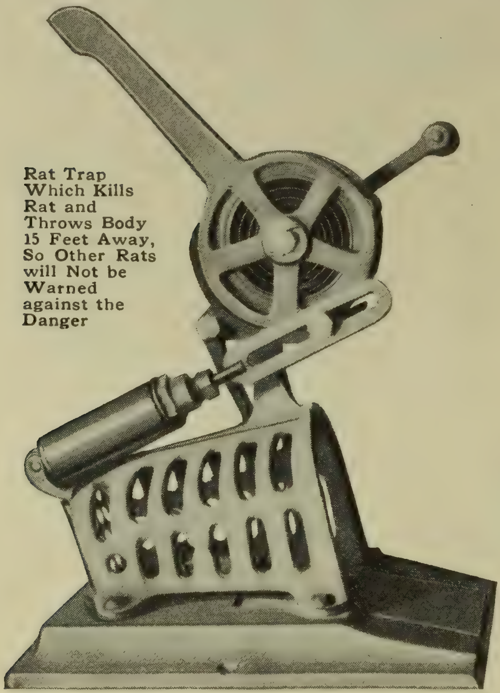
An English toe dancer who is filling an important rôle in a Berlin ballet finds that a heavy lawn roller is one of the best implements imaginable for training the toe muscles. In pushing the roller over the lawn, she rises upon her toes, which become the pivots sustaining all the weight and energy she has to exert to overcome the roller's distaste for rolling.

An English Ballet Dancer Who Finds a Lawn Roller Most Excellent in Training Her Toes

RAT TRAP TOSSES VICTIMS MANY FEET AWAY

Because of its peculiar construction, the "Ratapult" is the name that has been given a novel rat-destroying device, which was one of the exhibits of an exposition held recently in Washington under the auspices of the United States Public Health Service.

The apparatus is so arranged that when an unsuspecting rodent enters a cagelike compartment to get at the bacon rind with which the trap is baited, he steps on a lever which releases a spring mechanism fitted above it. A metal arm, operated by a powerful spiral spring, is released, and passing through a slot in the cagelike compartment, in the manner of a catapult, it strikes the unfortunate rodent with a blow of sufficient force to break every bone in its body and hurl the carcass at least 15 ft. away from the trap, far enough away so other rats will not be warned against the trap. The spring will operate the device 15 times with one winding. A pneumatic device prevents the arm from making more than one revolution and automatically "sets" it again.


Rat Trap Which Kills Rat and Throws Body 15 Feet Away, So Other Rats will Not be Warned against the Danger

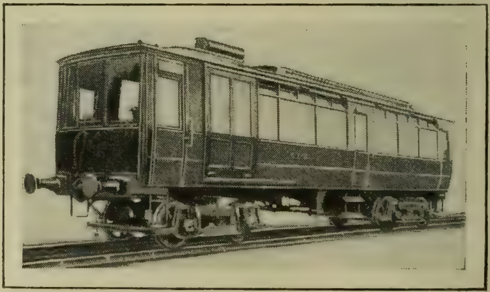
APRICOT PASTE AS TABLE DELICACY

Apricot paste is an oriental delicacy that is now getting attention in western countries, both for home sale and shipment to the Orient. The accepted method of manufacture is to crush the apricots in a cement-lined hole in the ground, 2 or 3 ft. deep. Some eastern peoples still knead the fruit with their bare feet. Farmers of America and southern Europe, who are just acquiring this new industrial art, use a large hard-rubber ball on the end of a club.

The pulp is then spread out on thin boards and placed under trees or in other shady places to dry. The boards are of uniform size, and the paste is so spread out as not to be thicker than 1/10 in. when dry, the cake weighing about 5½ lb. and looking like sole leather. The price varies with the quality, which is determined by the color and the thickness; 25 cents for a 5½-lb. cake being the average. There is a large market for apricot paste throughout Germany, Roumania, Egypt, and Syria. In the east it is given the special name of "pamereddin," and is used for flavoring wines, jam, puddings, and ices. New York and Chicago are just acquiring a taste for apricot paste as a fancy confection. Few Americans are as yet acquainted with this ancient Egyptian dainty.

GASOLINE-ELECTRIC CARS FOR ENGLAND

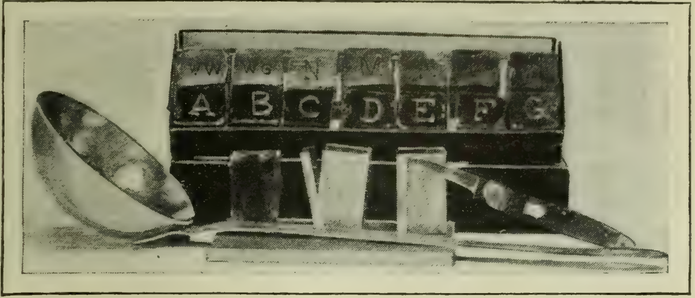
Tests are to be made in England of gasoline-electric cars for suburban traffic on one of the largest of the railroad lines. The cars to be used for the purpose are of a new type. They are divided into four compartments. At one end is the engine compartment where a six-cylinder gasoline engine will be installed to operate an electric generator. There are two passenger compartments in the center of the car, which are entered from a door in the center. The fourth compartment is equipped with various appliances for the driver in the operation of the car. The cars are not designed to attain a speed greater than 40 miles per hour.


New Type of Gasoline-Electric Car to be Tested in England for Suburban Traffic

DEVICE TO STANDARDIZE ROSIN GRADES

This country annually produces forty million 280-lb. barrels of rosin, having a value of approximately $200,000,000. For many years the crude methods of grading this product for shipment has lost the producer millions of dollars. The question today between the producer and user is one of samples cut in correct size.

Uncle Sam, through his Department of Agriculture, has devised a method which does away with cutting the sample. He has invented an apparatus which will mold a sample of exact size, by which the producer himself can grade the rosin as it is made at the still, and thus know definitely before shipment the quality of his product.



Government Device to Standardize the Grading of Rosin

The simple apparatus recommended for this work comprises a small mold made of two pieces of ordinary roofing tin. It is about 1½ in. high and exactly ⅞ in. square, inside measurements, which is the size the standard-grade samples should be cut. With the apparatus is needed an ordinary tin dipper, a knife and a set of standard rosin types. The samples are made while the rosin is still in liquid form in the barrels, and the type number is printed on each block sample to indicate the season in which it was produced.

The government experts declare that there is altogether too much low-grade rosin made, and assign three chief causes for this fact. First, the presence in the gum of considerable quantities of wood, bark, pine needles, charcoal and dirt which, through carelessness or accident, have collected in the gum in the woods and are allowed to remain in the still during distillation. The effect of the presence of this foreign material in the still is possibly well known to rosin producers, and it is most strikingly shown by the higher grades obtained from the same gum when the cup-and-gutter system of turpentining is used, especially if care is taken to keep out of the cups the bark and wood liable to drop into them during chipping; second, excessive or prolonged heating of the rosin in the still at the close of distillation, largely for the purpose of removing all turpentine and water which it may contain; and third, the presence in the finished rosin of much finely divided foreign material, such as charcoal and earth, due to faulty straining of the finished product.

WIRELESS STATIONS NOW WAR OBJECTIVES

In former wars the most vital points that an invading enemy endeavored to capture and the defenders to hold were the fortified places and cities. How this has changed is exemplified by the fact that during the naval demonstration in the Dardanelles this summer the principal aim of the Italian navy was to destroy the wireless stations of Turkey, and one of their battleships, the "Pisa," succeeded in demolishing the station at Tschesmé with about 90 grenades.

Similarly, during the recent revolution in China, the imperial troops were compelled to destroy the wireless station at Nanking in order not to give the insurgents an opportunity to use it.

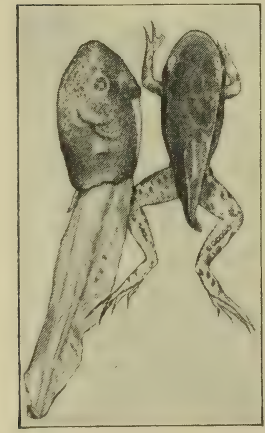
A Sea of Silk-Hatted Veterans of Germany's Wars

A "GERMAN SEA" OF SILK HATS

A sea of silk hats, each one surmounting a German war veteran, is shown in the accompanying illustration. The scene was enacted on Tempelhofer Field, Berlin, the veterans having gathered from all parts of Germany for the celebration.

SCIENTIST EXHIBITS HIS "FATHERLESS" FROG

The "fatherless" frog, which was created partly through chemical processes by Prof. Jacques Loeb of Chicago, was the biggest attraction among the exhibits of the International Congress of Hygiene and Demography recently held at Washington. The world's scientists marveled at the strange history of the specimen. One freak had only reached the stage of a tadpole, while the other was a fully developed frog, and neither had any father.



The frog was made to exist, according to Professor Loeb's explanation of its "birth," by submitting the egg of a frog to a chemical process. The egg was developed into a tadpole and finally into a frog. It developed into a very healthy specimen.

The process by which this frog was developed is entirely different from that by which a German scientist recently claimed to have produced life by solely chemical means.

ONE FREIGHT TRAIN WITH 131 CARS

The honor of hauling the longest freight train in the history of railroad transportation is claimed by a western road which recently hauled a train of 131 freight cars loaded with cantaloupes. The cantaloupes were grown in the southern part of California and the entire weight of the shipment is said to have been 2,061,500 lb. The cantaloupes were packed in cases of 50 each and there were 330 cases in each car. The cars were of uniform size.

ℭIt is possible to waterproof matches by simply dipping them in melted paraffin.

IS YOUR HOME WELL HEATED?

By PHILIP L. McKEE

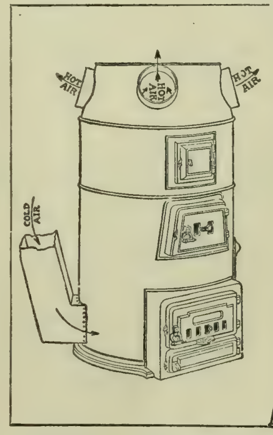
GOING to buy a home? Or do you want to get the best out of your present home? Then be sure it is well heated. If your home is to be comfortable and cozy during the cold winter months, it should have a modern heating plant. Every house owner should get acquainted with the things that go to make up a good plant.

The proper temperature for living rooms is generally set at 70 deg. F. With this temperature in the room and zero outside, a hot-water boiler should show a water temperature of about 180 deg., and a steam boiler a gauge pressure of 2 lb., which corresponds to a temperature of about 218 deg.

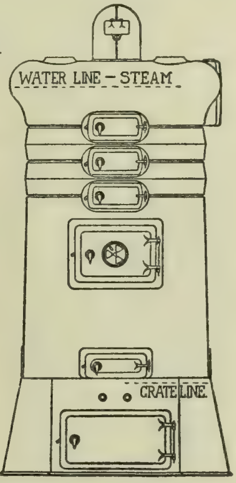
A simple approximate method will be all that is needed to figure the amount of radiation required for the various rooms in a house. The Mills rule is a very good one and easily understood. This rule is to the effect that, in the case of steam, for each 2 sq. ft. of glass, for each 20 sq. ft. exposed outside wall, and for each 200 cu. ft. of space, 1 sq. ft. of radiation should be allowed. For water 65 per cent should be added to the result obtained. For instance, if 51 sq. ft. is required for steam, the addition for water would be 33 ft., making a total of 84 sq. ft. of radiation.

Practically all house-heating boilers are rated on a basis of hard coal for fuel, as the heat value of hard coal is almost constant. There are so many varieties and grades of soft coal that it is impossible to set a general standard of fuel value, or power. The caking soft coals (which fuse and stick together when heated) are the most valuable for house-heating boilers. For warm-air furnaces stove or small-egg anthracite should be used. These sizes are also suitable for the average house-heating boiler.

Theoretically 150 cu. ft. of air are required to burn 1 lb. of coal. In practice, 250 to 300 cu. ft. are actually needed. The fact that the fuel burns freely is no indication of perfect combustion. Boilers containing the proper proportion of grate area and heating surface are most efficient when run at a combustion rate of 6 to 8 lb. per sq. ft. of grate an hour. If the combustion rate is much below 6 lb., it is due to an insufficient air supply; and if the combustion rate much exceeds 8 lb. there is an oversupply of air.



Typical Hot-Air Furnace, Showing Cold-Air Box, Hot-Air Pipes at Top, and Set of Doors



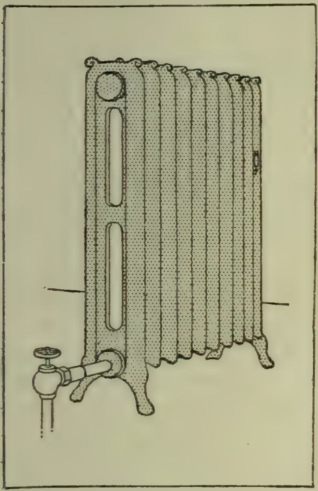
Common Type of Round Cast-Iron House-Heating Boiler

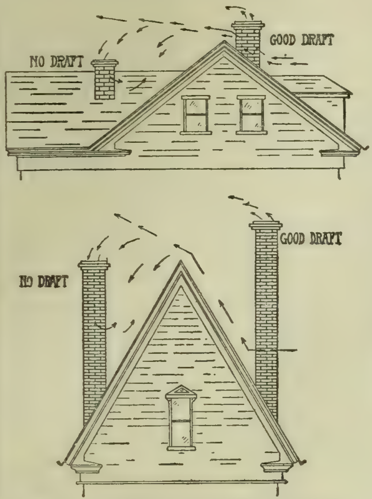
The most important part of any heating system is the boiler, or heater. This boiler must be one that is safe, easy to clean, of ample size and simple in operation. So far as size is concerned the boiler should be large enough to do the work. If for soft coal, it should be one size larger than when used for hard coal. As a general rule, the rating of a steam or water boiler as given in the catalog of the maker should be about 100 per cent higher than the actual radiation contained in the house.

Assuming that, with weather at zero outside and 70 deg. inside, the rooms in a small residence lose per hour an aggregate of 120,000 British thermal units, which is the American standard of measuring heat, 500 sq. ft. of steam radiation will be required. To this amount 25 per cent should be added to cover the loss through the piping, making an additional tax of 125 sq. ft. A boiler, at 625 sq. ft. of steam radiation, should have a capacity of 150,000 British thermal units per hour, and a fuel consumption of 17.7 lb. of anthracite coal per hour. If it is desired to keep the fire going for eight hours, the hourly consumption should be multiplied by eight, giving a total of 141.6 lb. of fuel, but as only 80 per cent of the fuel in the boiler should be burned before the fire is replenished, the fuel capacity must be 25 per cent greater, or 177 lb., that is, exactly 10 times the hourly consumption. An extra allowance must be made if soft coal is used. The rooms in the house should be gone over very carefully, and the number of square feet of radiation installed figured, with the aid of a boiler and radiator catalog, comparing the result with the rating for the boiler. If this is satisfactory, the size and fuel capacity of the fire pot should be ascertained.

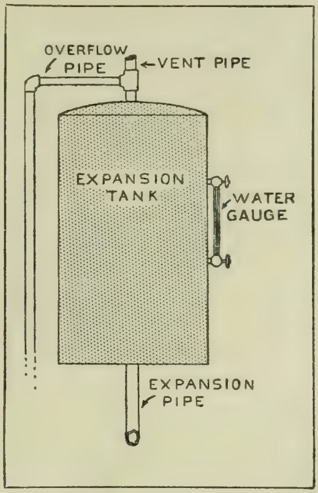
Every boiler should have at least one good damper for regulation of the draft. It would be better to have two, one in the boiler smoke elbow and the other in the smoke pipe near the chimney. Clean-out doors should be provided that will give ready access. Grates are one of the first things to wear out, so that they should be carefully looked over to see whether they are straight or bent out of shape, and that they operate easily. The boiler should have a door for removing clinkers; the ash pit should be large and deep so the ashes will not pile up under the grates and warp them; and the fire door should be large enough to admit fuel readily from the shovel. A hot-water boiler should have a thermometer and an altitude gauge to show whether the system is properly filled with water. A steam boiler should be fitted with a glass water gauge, try cocks, water column, steam gauge, safety valve, and a good automatic damper regulator. A check damper should be provided on the smoke elbow of every boiler, and a check draft on the ash-pit door. After the boiler has been filled with water, it should be carefully examined for leaks. Leaks are difficult to repair; therefore one should insist on the boiler being tight. It should first be tested without fire and then with a good fire until the water temperature reaches about 160 deg. If the boiler is of the steel-flue type, it is best to have an actual test made by a competent man. For the sake of economy, the boiler should be covered with asbestos cement to a thickness of at least 1½ in. All the pipes should be lined with a good covering, about ¾ to 1 in. in thickness. A water-supply connection with a valve should be provided.

Steam is probably more largely used than any other heating system. The low-pressure system is the one commonly used in residences, and, therefore, is the one that will be described. There are two principal methods of installing a low-pressure steam system for residence heating; the single-pipe system and the double-pipe system, but the former in late years has come into almost exclusive use. In it only one pipe connection is made to each radiator. This pipe supplies the steam and carries the condensation water at the same time. Every piece of pipe in a steam system should have a fall toward the boiler, so that all condensation water will drain back to it. A fall or pitch of 1 in. in 15 ft. is considered standard by many heating engineers. All pipe should be evenly graded, and the rise from the boiler to the highest radiator in the house continuous. A downward bend followed by an upward bend in a steam pipe produces a water pocket and seriously interferes with the circulation of the steam. As a rule all branches from the main steam pipe should be taken off midway between the side and the top of the pipe, not from the top or the side. It should be carefully noted how the branches have been taken off for each radiator, and the pipe lines at the same time followed up to see that they have the proper pitch. A small pocket level will be of much help in finding the pitch of pipe lines, and will at least indicate in which direction the pipe rises or falls. Every radiator should be fitted with a first-class air valve, located on that end of the radiator opposite to the pipe connection, and about halfway down. It should be automatic in operation and non-leaking.


Common Single-Pipe Steam System, with Only One Connection to Each Radiator



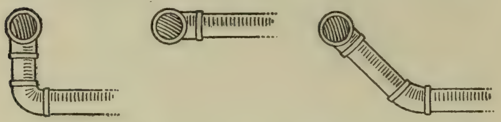
Every Chimney should be Carried at Least Four Feet above Surrounding Objects to Insure Good Draft



An Expansion Tank is Necessary in a Hot-Water System, But may be Placed in a Closet

The hot-water system in many cases is the easier to operate and to understand. Owing to the fact that the temperature of the water in radiators of this type is not so high as that of a steam radiator, it is necessary to have more radiating surface in this system. As in the steam-heating plant, there are two general methods of installing a hot-water system: single-pipe and double-pipe systems. The double-pipe system is the one that gives best results and is in almost universal use. Of this there are various kinds, but as a rule the open-tank gravity system is preferred. In the double-pipe open-tank gravity system the flow or supply pipes are taken off at the top of the boiler and the returns are connected near the bottom. As the water is heated it becomes lighter, expands and rises in the flows until it reaches the radiators. In these, and as it travels along, the water is gradually cooling and throwing off heat units to the surrounding air. At the same time it contracts and becomes heavier so that it falls again toward the boiler, where it is heated and sent out again on its journey through the system.

As in the steam system it is very important that every piece of pipe have proper pitch. All flow lines should pitch up from the boiler to the radiators and all return lines should pitch down from the radiators to the boiler. An upward bend followed by a downward bend in a hot-water pipe forms an air pocket, which is an unfailing source of trouble. Each radiator must be fitted with a good positive air valve, the best being one that is operated with a key. The radiator supply valve should be located on the radiator supply pipe, or flow, and should be of the quick-opening type so that one half turn of the wheel will open or close it completely. The return pipe for the radiator should be connected with the combination fitting which is known as a "union elbow." Branches from the main flow pipe in the basement should be taken off on the side or at an angle of 45 deg. above the side. As every fitting, every turn and every connection adds friction and tends to retard the circulation of the water in the system, the turn should be made as rounding as possible and the water given every opportunity to circulate rapidly and easily. Each line of pipe connecting to the boiler should be provided with a good gate valve so that, in case of accident to the boiler, these valves may be closed and the water retained in the system until repairs are made.



Branches for the Main Supply Pipes should be Taken Off at an Angle, from the Side, Top, or Midway between Side and Top of Pipe

As the water in a hot-water system expands when it is heated, it is necessary to provide for this by using an expansion tank. This tank may be of any style or shape, but should be large enough to contain 5 per cent of all the water in the heating system, unless it is of the automatic type. The expansion tank should be placed above the highest point on the system and is usually located in some closet on the top floor. It should be carefully protected from the cold so as to prevent freezing. When the system is supplied with water through the expansion tank, a connection will not be needed at the boiler.

The hot-water system previously described is what is known as an open-tank gravity hot-water system. Some systems have been put in with closed expansion tanks to get pressure on the system and to carry high water temperatures, but this is unsafe and should be avoided. To heat the water to a temperature of 240 deg. means the consumption of a large quantity of fuel in a short period of time, and, as a rule, it is not economical.

Leaving out of consideration several less common systems, the warm-air furnace will now be described. It is one of the older heating systems and operates on a very simple principle. The cold air is drawn from the outside of the building into the furnace jacket where it passes over the heated surface of the furnace into pipe lines that conduct it up into the rooms to be warmed.

The most important requirement of the warm-air furnace is that it be gas-tight and dustproof. Often when furnaces have been in use a few years the parts become loose, and dirt, ashes, smoke and gas will be carried up into the rooms. Therefore the furnace should be carefully and thoroughly examined, especially the connection between the feed door and fire pot and the connection between the clinker door and fire pot, which must be perfectly tight. In order to do good work, the furnace should be one size larger than is actually necessary. This will also save fuel and labor. The air supply should be abundant and the fresh-air inlet properly located. The cold-air box should always be located on the coldest side of the house, north, northwest or west. This box should have an area equal to the area of all the warm-air pipes, should be connected to the rear of the furnace and provided with a side damper to regulate the supply of air. This cold-air box should have a damper or valve at the point where it enters the building and a connecting pipe leading to the main hall so cold air can be taken in from the inside when there is a storm or blizzard, or strong east winds are blowing. If there is no connecting pipe to the hall, the cold-air box should have a side door equal to the full width of the box. It is not a good plan to take cold air directly into the furnace jacket at the bottom off the basement floor, and it is even worse to take in the cold-air supply through a trench underneath the furnace.

The furnace should be centrally located or so that the shortest warm-air pipe lines run to the cold side of the house. Every extra foot of pipe means the use of more fuel. Each pipe should, therefore, be as short as possible and fitted with a damper close to the furnace. The warm air goes with the wind and it is best to have the longest pipe lines for the south and east rooms. The tops of all pipe lines should be level with each other, that is, the top of one pipe should be on the same level as the tops of all others connected to the furnace. The top of the warm-air pipe should never be lower than the top of the furnace, or rather the top of the bonnet, as it is called.

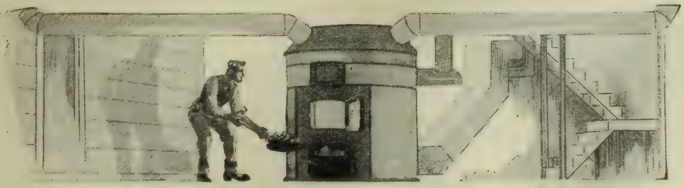
Rooms on the cold side of the house should have one size larger pipe and register than rooms of the same dimensions on the warm side of the house. Rooms with more than the average glass exposure or with large bay windows, when located on the cold side of the house, should have pipe two sizes larger. All pipe in the basement should be covered. Risers should be carried in inside partitions and covered. They should all have a good upward pitch from the furnace—at least 1 in. in 10 ft. There should be no sharp bends or acute angles and every line should run straight, and where a pipe enters the riser, it should be bored out.

All registers on the first floor should be placed in the floor and not on the wall. They should be located on the side of the room nearest to the furnace; none in front of or near an open fireplace. The size of register required for various rooms can be found in the catalog of any good furnace house. The pipe in the partition must be of the same size as the pipe which is used in the basement.

The chimney is about as important as any other part of the heating system. It should extend above the highest point on the roof and above any near-by objects, such as adjoining houses, tall trees, etc. This is very important. If the flue is divided, the dividing walls should extend the entire length from top to bottom. Preferably, the flue should be located on an inside wall, but if on the outside wall, the breast of chimney should extend inside rather than outside. The flue should be the same size from top to bottom and there should be no openings into it except that for the boiler. The area of the flue should never be less than the area of the smoke elbow on the boiler, and in no case below 8 in. in depth. For the average seven-room-house chimney, the flue should be about 10 in. square and approximately 40 ft. in height. As to the cross section, rectangular, oblong flues are the best, square ones coming next, while the round form is not efficient. The warmer the chimney can be kept, the better the draft.

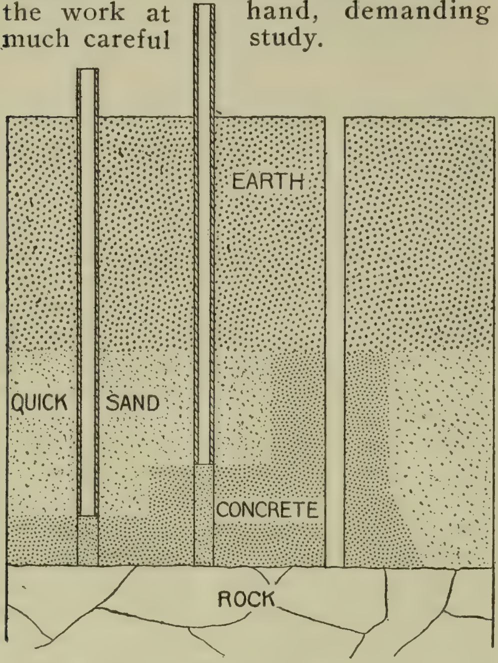
The heating system should be kept in good repair; the water in the system should be changed every season, for, if dirt is allowed to accumulate outside or inside of the system, the absorption of heat is decreased, more fuel is required and the various parts are more susceptible to rust. The ashes should be removed regularly at least once a day, and oftener, if they reach up to the grate bars, for, with a good fire above and the air shut off below, the bars will melt down quickly. Steam or water escaping from a valve stem cuts it out, which results in waste of fuel; the valves should therefore always be properly packed.

A little attention at the proper time is all that is required to have things just right, and it means a decided saving in cost of upkeep and fuel, besides being the only manner in which to secure the best efficiency of any heating system.



INJECTING CONCRETE TO OVERCOME QUICKSAND

The sinking of mining and engineering shafts is often made difficult by the encountering of bodies of quicksand. The problem that arises often blocks the successful execution of the work at hand, demanding much careful study.



Section Illustrating the Process of Injecting Concrete into Quicksand to Form a Wall around an Area in Which a Shaft is to be Sunk. Dark Shadings in Lower Portion of the Diagram Show Quicksand Impregnated with Cement at Different Stages of Operation

One method proposed to overcome the quicksand is the injection of concrete. It consists in cementing that portion of the sand stratum immediately surrounding the proposed shaft into a solid, watertight concrete mass.

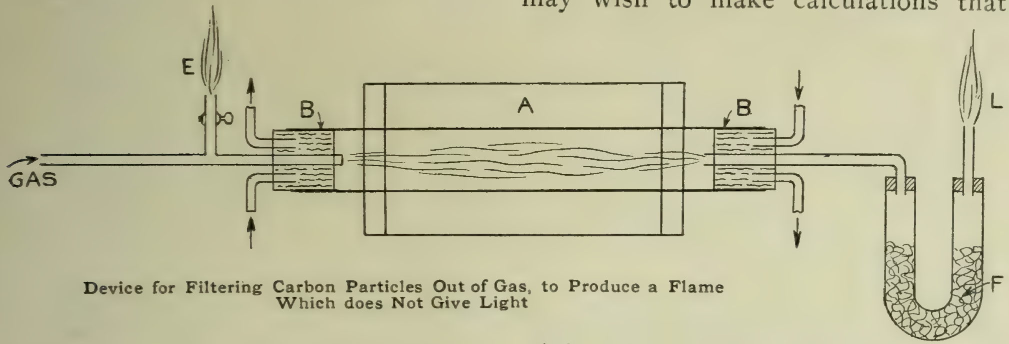
In the illustration, which is a vertical section through a surface stratum of subsoil, a substratum of quicksand, and beneath that a base of rock, is shown the injection method of treating shafts. This diagram and the description of the process is taken from the Iowa Engineer.

The initial step of the process consists in locating the spot where the shaft is to be finally sunk, and then to bore an outer series of holes around it to form a skeleton. As each hole is drilled, a well casing is driven through the stratum of quicksand. The number of holes depends upon the fineness of the sand. As soon as the drill has been removed and a well casing put in place, cement, mixed with a large proportion of water, is forced down by hydraulic pressure, and the casing is pulled up about a foot so that the cement will flow out laterally from the bottom of the pipe. After a time the sand will become choked with the cement, which will be recorded by the pressure gauge on the pump. Then the casing is raised another foot and cement injected until the gauge shows the second portion of quicksand to be impregnated, and the process is repeated until the entire stratum has been treated. The next hole in the outer series is treated, and so on, until the series is completed. Around each hole there will now be an area of solidified quicksand, but no two of these areas merge. Therefore it becomes necessary to sink an inner series of holes, so located that the area treated through each will close up the interstices between the areas treated through the first series of holes. It is quite possible, however, that even as yet a perfectly watertight wall has not been formed around the shaft area, and it may be necessary to drill one or two extra holes, through which cement will be forced out into the gaps remaining, thus causing them to be effectively filled.

After the concrete has been allowed a sufficient time to set, the shaft may be sunk.

FILTERING THE LIGHT OUT OF A FLAME

A very simple apparatus which demonstrates that a flame will be hot but will not give light if the particles of soot are filtered out has just been invented by Dr. Arthur Staehler, of the University of Berlin. When ordinary illuminating gas is burned it gives considerable light, but, if its temperature is previously raised to a very high degree by passing the gas through a tube heated by an electric furnace (or in a gas furnace), the carbon is separated from the gas, and can be filtered out if the gas is made to flow through moist glass wool. When this filtered gas is burned, its flame gives no light, while on the other hand it is extremely hot, containing, as it does, a large percentage of the gas hydrogen.



Device for Filtering Carbon Particles Out of Gas, to Produce a Flame Which does Not Give Light

In the figure is shown a sketch of the apparatus. At E ordinary gas is burning with a luminous flame, which immediately blackens a piece of porcelain put into the flame. After passing through the furnace A, the gas is filtered through glass wool in F, and burns without giving light at L. If a cold piece of porcelain is put into this flame, no carbon is deposited, and the porcelain remains white. The stoppers B are kept cool by flowing water through them, but the use of a longer tube would serve the same purpose.

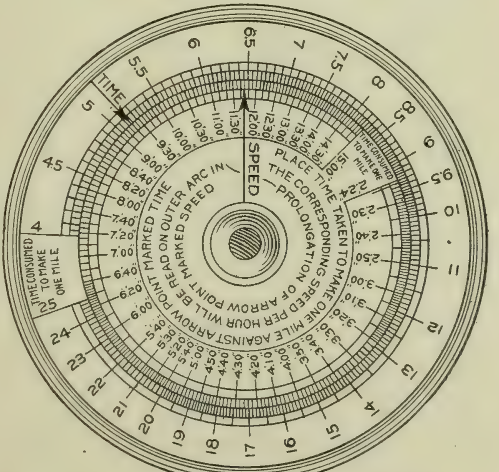
AUTOMATIC FIRE APPARATUS FOR SHIPS

An automatically acting fire-extinguishing apparatus for vessels is a recent invention of a Swedish engineer. From a centrally located tank, containing carbonic-acid gas under pressure, pipe lines are run to the various holds and compartments of the vessel. At the ends these pipes are closed by plugs of metal, having a low fusing point, so that, should a fire start anywhere, the plugs soon melt, allowing the carbonic acid to fill the room and effectively extinguish the fire.

AN INGENIOUS SPEED-CALCULATING DISK

The neat little speed-calculating disk shown in the accompanying illustration should be welcome to motorists, motorcyclists, airmen, and others, who may wish to make calculations that might prove troublesome without such aid; as, for instance, when a motorist, after observing the time it has taken his car to make the distance between two mile posts, wishes to determine the speed in miles an hour.

The calculating device consists of a large disk, with a small one centered over it. Each disk carries a scale. In calculating speed in miles per hour, the figure on the small disk representing the time taken to drive a mile is, by revolving this disk, brought opposite a fixed arrow marked "Time." The


TIME
SPEED
PLACE TIME TAKEN TO MAKE ONE MILE AGAINST ARROW MARKED TIME
THE CORRESPONDING SPEED PER HOUR WILL BE READ ON OUTER ARC IN PROLONGATION OF ARROW POINT MARKED SPEED
TIME CONSUMED TO MAKE ONE MILE
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
11
12
13
14
15
16
17
18
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20
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24
25

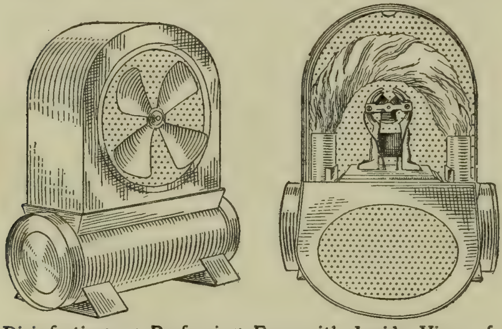
Speed Calculator; the Time Arrow Being Opposite to 9 Min. 20 Sec., and the Speed Arrow to 6.45, Indicates That 9 Min. 20 Sec. Consumed in Making One Mile Corresponds to a Speed of 6.45 Miles an Hour other arrow then points to the figure showing the speed made, in miles per hour.

To give a considerable range to the calculator, one side is graduated for slow speed, from 4 to 25 miles an hour, for walking, marathon running, boating, and the like, and on the other side are scales for 12 to 90 miles an hour.

The device is fitted with an aluminum rim, has transparent celluloid faces over the disks, and is sufficiently small to be carried in the pocket.

ELECTRIC PERFUME AND DISINFECTOR FAN

A small electric fan, obtaining power from a dry battery contained in its base, and designed to disinfect the air of a room or perfume it, is here illustrated. Back of the fan is a perforated metal receptacle containing a large wick, which may be saturated with any liquid disinfectant or perfume, the odor of which is emitted immediately upon turning on the electric current.



Disinfecting or Perfuming Fan, with Inside View of Casing Showing Motor and Wick for Liquid

PICKING AIR BUBBLES OUT OF AN AQUEDUCT

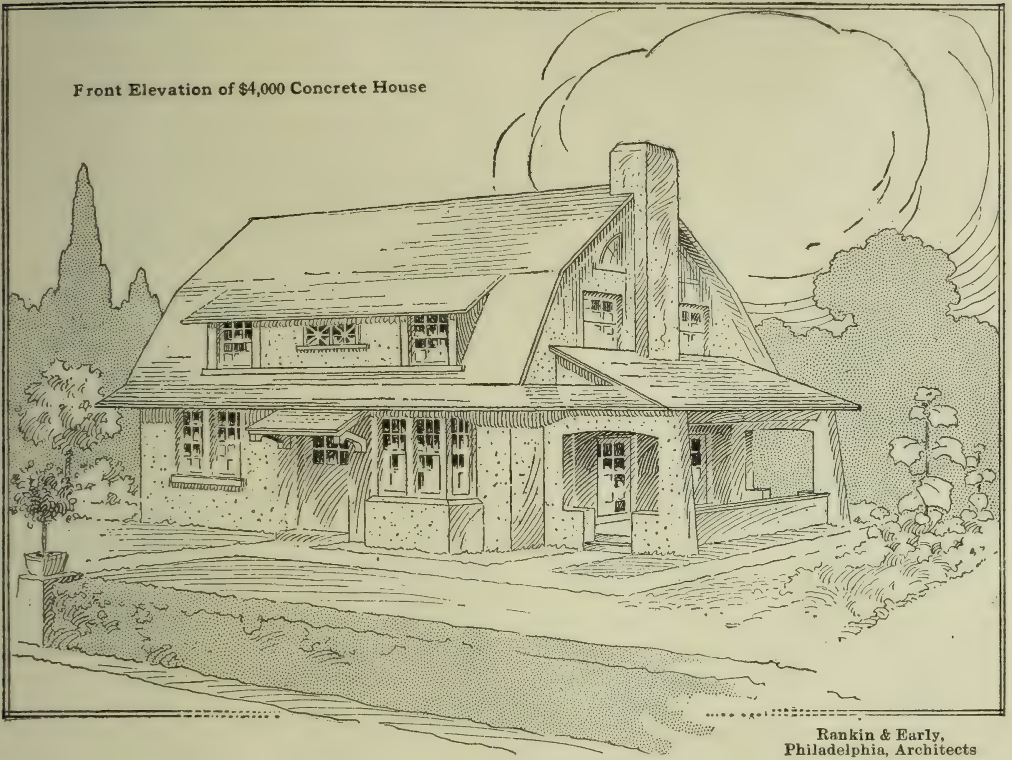
Timing the ascent of an air bubble in a column of water with a split-second watch might seem to be a foolish occupation for sane and sober men—but the success or failure of one of the biggest city water-supply systems in the world might depend on the conclusions reached by just this process.

The water system is no other than the new Catskill aqueduct that brings water from the mountains to the people of New York city, and the tests of this nature that have recently been made have a most direct bearing on the manner of removing surplus air from the water as it comes into New York city, so as to insure the proper pressure in the city mains. If this surplus air is not removed, the water will not have pressure enough to do what the people who planned the aqueduct intended it should. At one point in the long journey from the mountains, the water makes a considerable fall and in so doing the rushing torrent naturally collects an excess of air.

It is imperative, for the reason stated, that the greater part of this air be expelled before the city mains are reached and an apparatus has been installed in the aqueduct for such a purpose. Equally necessary were tests as to the time it took the air to rise to the surface of the rushing stream, where it could be caught and removed, before the exact proportions of the air extractor could be calculated. To determine this, a vertical tank of wood, 6 in. square and 11 ft. high, was made, into which windows were set so that the rise of air bubbles could be traced. A tube from a compressed-air chamber was fixed in the bottom of the tank and water turned into the big column. Air bubbles were then introduced into the bottom of the tank from the compressor and the rate of speed at which they traveled to the top of the tank was observed with stop watches. Various sizes of bubbles were made by turning in various quantities of air. It was found that larger bubbles traveled to the top with greater velocity than the smaller. From data obtained in these tests, the air remover for the aqueduct was designed. It is not intended to remove from the water the air which it normally holds in suspension, but only a sufficient amount to insure proper pressure in the city.

ℭA method of plastering walls by spraying has recently been patented in Germany.

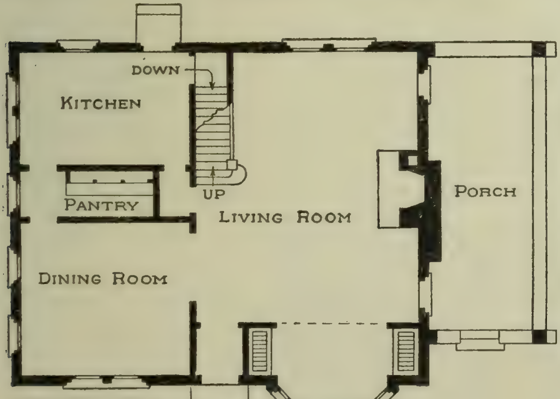
ROOMY CONCRETE HOME TO COST $4,000



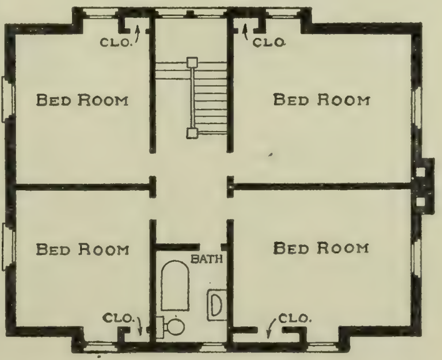
Front Elevation of $4,000 Concrete House

Rankin & Early,
Philadelphia, Architects

The planning of a home that will be individual in design and at the same time come within the limitations of a lean purse, is a problem that is apt to perplex even a resourceful architect, and cause him to grow old before his time. In the preparation of the accompanying plans, the architect has met the requirements of the man in moderate circumstances, and at the same time has produced a building that has many attractive features. The plans provide for seven rooms, all of good size. The house is designed to occupy a large lot and is, therefore, better suited for the suburb or country than for a city home.



First-Floor Plan

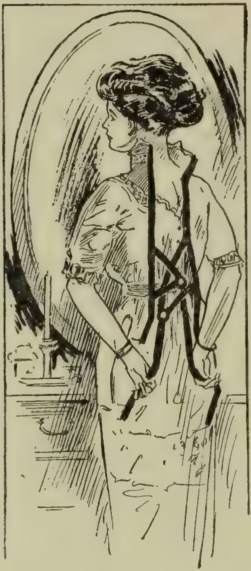


Second-Floor Plan

The cost, estimated at the price of materials in Philadelphia, has been set at $4,000.

THE BUTTONLESS WAIST AN ACTUALITY

The waists that button up the back, requiring joint-twisting gymnastics on the part of the woman, if she is to button it herself, and ill-suppressed exasperation on the part of the male member of the family if he is called upon for the emergency, will be a torture of the past, if a French inventor has his way.



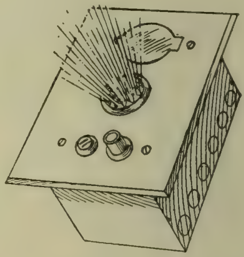
This inventor has come forward with a practical device to overcome the trouble, while, at the same time, retaining the practice of having the waist fasten at the back. The device, for which this inventor certainly deserves the everlasting gratitude of the members of both sexes, consists of two whalebone ribs, sewn one to each edge of the waist, and provided at top and bottom with two snap buttons. Ribbons are attached just above and below the centers of the whalebones as shown. When the waist is put on, the buttons at the neck are snapped together, one of the ribbon ends is drawn through the triangle formed by the ribbons of the other side, and then the two ribbon ends are brought to the front underneath the bottom edge of the waist, pulled until the ribs are brought closely together, and tied. Whereupon the two snaps at the bottom of the whalebone strips are pressed home, thus completing the operation. Voila!

AUTOMOBILE TRAFFIC DRIES OUT WET ROAD

Drying roads with automobiles is the latest development of the usefulness of the horseless vehicle. Recently, when it was decided that the Vanderbilt cup races would be held near Milwaukee, the course for the race was found to be too wet for the preliminaries to the big event, owing to heavy rains. The managers of the race were at their wits' ends to devise a method of drying up the road, until it suddenly occurred to them that continuous traffic by motor cars would do the work. Invitations were extended, therefore, to all who owned automobiles to go over the course, an explanation being made as to the cause of the invitation, public spirit being thus aroused. Before sunset on the day the invitation was issued, there were more than 500 cars speeding around the course, ranging in size from a small electric to a heavy beer truck. The result was that the track was dried out to an extent that had seemed impossible.

INDICATING SWITCH FOR ELECTRIC STOVES

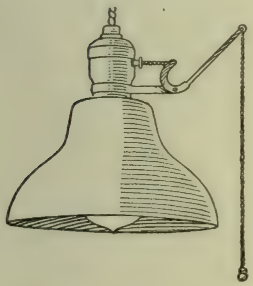
A special switch and indicating outfit for use in connection with electric heating and cooking appliances is being placed on the market by an electrical concern. It comprises a suitable switch, a lamp and base receptacle, and flush plug and receptacle mounted in a box covered by a brass faceplate, in which a crystal or ruby cut-glass jewel is mounted. When the switch is in circuit this glass eye of the switchbox is illuminated, thus providing a visual indication that the switch is on, and preventing loss of current through carelessness when the cooker or heater is not used.



ANCIENTS HAD TRICK OF CASTING BRONZE

Recent studies of bronze castings known to date from the latter part of the bronze age, show that many of them were made in molds of clay which had been heated to a dull red before the metal was poured in, the method indicating a high state of development of the art. In Japan this method is still used by the native makers of fine, thin knives and swords. The castings were always hammered at the cutting edges, and to this and not to tempering, is due the hardness of both copper and bronze weapons of early ages.

DEVICE FOR PULL-SOCKET ELECTRIC LAMPS

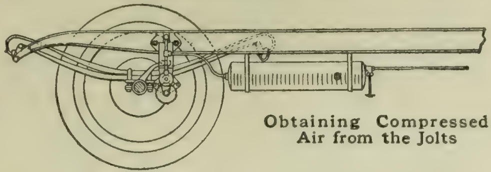


An attachment for pulling the chain of the pull-type electric-lamp socket is here shown. It is attached to the socket, instead of to the shade holder, and a slight pull on the cord produces an even, firm pull on the chain, which is drawn directly outward.

COMBINED AIR COMPRESSOR AND SHOCK ABSORBER

Using the jolting motion of an automobile to provide compressed air for inflating tires, for operating a pneumatic motor starter, and for other purposes to which compressed air can be applied, as well as taking advantage of the air's natural resistance to such compression in making it work as a shock absorber, is to be accomplished by the mechanism shown in the diagram, according to patent specifications.

A cylinder is attached to the automobile body, and the piston is connected with the springs in such manner as to be operated by the car's jolting. A reservoir is provided for the storage of the compressed air.



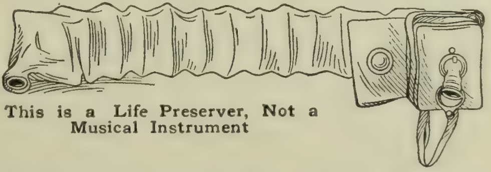
Obtaining Compressed Air from the Jolts

ENORMOUS POWER NEEDED FOR SWISS RAILWAYS

A billion and a half electrical horsepower will be necessary to convert the Swiss state railways to electric traction. This figure has been determined after careful investigation of the subject by a committee appointed for the purpose. It is stated in the committee's report that hydroelectric plants that must yield this amount of power would be required. This can be obtained without much difficulty, however. The cost of the transformation of the St. Gothard railway alone, it is estimated, will be about $13,000,000, but the operation of the road with electricity would result in a considerable reduction of expenses over the present costs.

LIFE BELT RESEMBLES A CONCERTINA

The "Titanic" disaster proved a stimulus to inventors in the production of new forms of life belts. Among the types which have recently appeared is the one shown in the accompanying illustration, reproduced from the Illustrated London News. When not in use it is inclosed compactly in the case to which it is attached. When required in an emergency it is drawn out, accordion-fashion, and thus automatically inflated.



This is a Life Preserver, Not a Musical Instrument

HUNTING FOR GOLD WITH WIRELESS WAVES

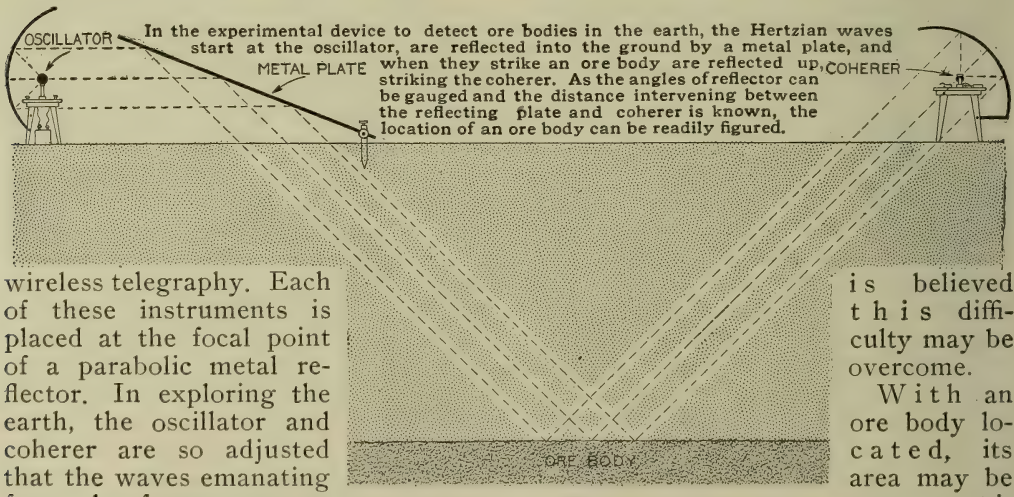
Wireless telegraphy for locating precious ores is now being carefully tested out by German scientists, with enough success to give hope of eventual practicability. The use of the Hertzian waves for exploring the earth's interior originated with Prof. O. Trustredt, a noted German metallurgical engineer, and experiments are being conducted at the Freiberg School of Mines by Professors L. R. Beck and Zimmerman.

While the earth does not permit the passage of electricity into its interior, the Hertzian waves readily penetrate the ground until checked by metals, water or similar materials. As is well known, the wireless waves are not electric, but a form of oscillations or waves set up in the ether by the discharge of electric sparks. These oscillations readily penetrate paper, porcelain, sands and clays. But should a metal plate be encountered they are reflected. It is on these well demonstrated principles that the use of wireless for exploring the earth's interior is based.

In practice two instruments are employed, the oscillator, or sender, and the coherer or receiver, substantially of the same nature as those used in wireless telegraphy. Each of these instruments is placed at the focal point of a parabolic metal reflector. In exploring the earth, the oscillator and coherer are so adjusted that the waves emanating from the former are reflected so that, if no obstacle were interposed, they would strike the mirror of the latter in parallel lines and therefore converge on the coherer at its focus. But in the path of the rays from the transmitter to the receiver is placed a metal plate which prevents the passage of waves to the receiver and reflects them obliquely into the earth. The waves pass readily through comparatively dry strata of sand and clays, much as light penetrates glass, but when an ore body or watercourse is encountered the rays are deflected upward through the earth as a mirror casts back sunlight.

The waves in their upward flight are arrested by the reflector of the receiver and the angle to which the receiver's reflector must be turned in order to catch and focus them on the coherer, and the distance between the center of the interposed reflector plate and the focal point of the receiver's reflector furnishes a means to calculate the depth and position of the ore body or watercourse. An electric gong inserted in the power circuit of the receiver gives the alarm when rays pass from the oscillator to coherer. It is apparent that the greatest obstacle to be conquered is the penetration of damp surface strata, but by using powerful transmitters it is believed this difficulty may be overcome.

With an ore body located, its area may be approximately determined by taking several observations, with the transmitter and

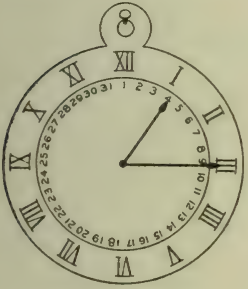


In the experimental device to detect ore bodies in the earth, the Hertzian waves start at the oscillator, are reflected into the ground by a metal plate, and when they strike an ore body are reflected up, striking the coherer. As the angles of reflector can be gauged and the distance intervening between the reflecting plate and coherer is known, the location of an ore body can be readily figured.

receiver placed at various points. The character of the body must, of course, be determined by drilling.

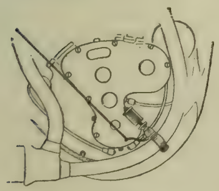
This use of wireless for detection of valuable metal deposits is naturally only in an experimental stage, and many obstacles remain to be overcome; but the future is freighted with interesting possibilities. The results following the experiments may eventually revolutionize the mineralogical world and open treasures of wealth dwarfing all hitherto found.

DIAL TAGS FOR KILN DOORS



The kiln doors of a Detroit concrete-products concern are each provided with a wooden dial of the type shown in the drawing, the purpose of which is to indicate the time at which the kiln was filled. The long hand indicates the hour at which the kiln was charged, and the short hand, pointing to the inner circle of numerals, shows the date of the month. The hands, as shown in the illustration, indicate that steam was turned on in the kiln at three o'clock on the fourth day of the month.

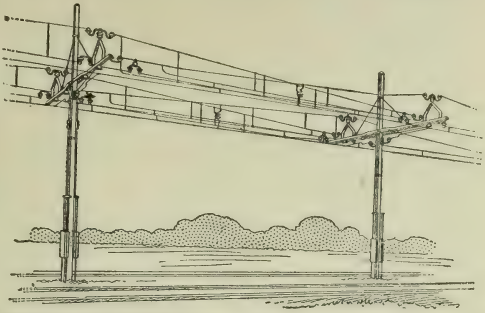
STEAM WHISTLE FOR MOTORCYCLES



A steam whistle as a motorcycle signal is somewhat unusual, yet a method of successfully adapting such a whistle to this use is here shown. It is an ordinary steam whistle of small type, fitted to the exhaust pipe, and controlled by a wire running to the handle bar. It sounds much like the signal of a boat.

AUTOMATIC TROLLEY-WIRE TIGHTENERS

Trolley wires provided with automatic tighteners, which compensate changes in the length of the wires due to variations of temperature, are shown in the accompanying illustration. The automatic tightening is accomplished by means of weights moving up and down the poles and connected to the trolley wire by means of chains passing over pulleys.



Courtesy The Engineer

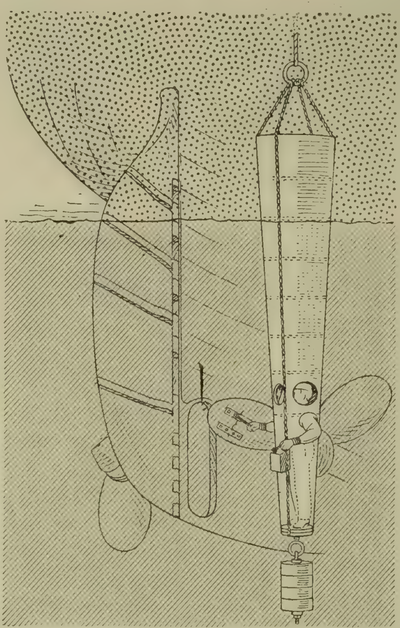
Weights, Moving Up and Down the Poles Automatically Tighten the Trolley Wires

FLOATING FACTORIES FOR INDIAN WATERWAYS

Floating factories have become an important part of the development of the forest resources of India. In certain parts of the vast oriental empire of Great Britain the forests are only accessible through the watercourses, and the great expense of erecting land plants for the utilization of the lumber resources makes such a course impracticable. Therefore, sawmills and other manufacturing establishments are built on floating platforms and moved up the streams as they are needed. After the lumber is prepared in a sawmill it can be packed in a way that makes transportation much more economical than any system of logging. Plants for the preparation of tannin extracts have also been established in this manner. The plants are built on flatboats, 200 ft. long by 27 ft. wide, capable of carrying a load of 470 tons.

DIVING APPARATUS FOR BOAT REPAIR

A diving apparatus, designed to be carried on vessels for use in making minor repairs to the hull or propellers, has been invented by a German sea captain. It consists of a bag of watertight canvas, weighted at the bottom and kept in shape by longitudinal rods. The bag, the top of which must be kept above the surface of the water, has a diameter of 2 ft. at the top, and of about 1 ft. at the bottom. At the height of a man's eyes from the bottom are three glass windows, through which the man doing the repair work may view the operation. At a convenient distance below the windows are two sleeves with rubber cuffs, into which the sailor inserts his arms in order to perform the work.



An Apparatus in Which a Workman may be Let Down into the Water to Make Minor Repairs to a Propeller or Ship's Side

THE USE OF MIRRORS ON AUTOMOBILES

That the mirror placed at the front of an automobile to enable the driver to see what is approaching from the rear may become a source of danger at night was recently shown by an accident to an English motorist. Driving at night, he was suddenly blinded by the glare of the lamps of a car approaching from the rear, reflected to his eyes by the mirror on his own machine.

A motor magazine suggests that the mirror be covered at night, but that this covering be a thin material that would prevent reflections of sufficient strength to dazzle the driver's eyes, and yet would allow him to see in the mirror the lights of any vehicles approaching from the rear.

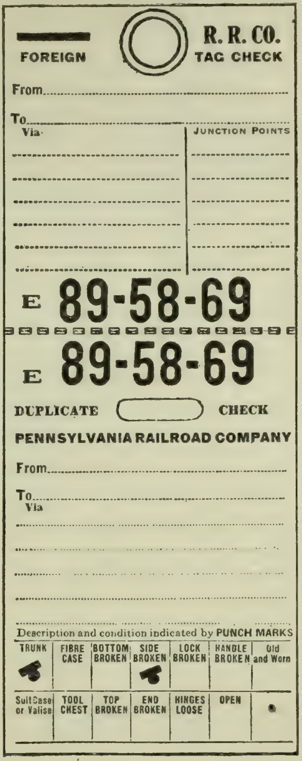
SCENERY EXTENDED BEYOND LIMITS OF STAGE

With the aid of a few lenses and a steady beam of light, the drama has burst through the bars that confined it to the limits of a small stage and a few scenes and may now roam the wide world. The motion picture has gone into partnership with the so-called legitimate form of acting and the new combination has made it possible for actors and actresses not only to sing and dance and play in the one spot represented by the original scenic setting, but to wander forth where they will and do what they will in other sections of the world. In Shakespeare's day one scene represented everything and it was frequently necessary to place signs on pieces of furniture to designate the woods through which Orlando roamed, the battlements over which Hamlet peered or the field of battle where Richard cried in vain for a horse. In later development the stage managed to counterfeit more closely the surroundings in which the mimic lords and dukes were supposed to move and have their being. Only a year ago a masterpiece of scenic structure represented an African desert and this cost a fabulous sum to transport from its original setting to the metropolitan theater where it was shown. But even with these conditions there were narrow limitations to the action of the piece. It was not possible to present more than six or eight scenes and usually only three or four, thus confining the action of the story to a few localities and making it necessary—as in the case of dramatized novels—to seriously disturb the original trend of the author's route for his characters from the first to the last chapters.

But suddenly these limitations have been abolished. A genius has arisen who does not find it necessary for the hero and heroine to pass from the view of the audience with their exit right or left, as the case may be, to carry through further development of the plot. With the motion-picture machine the movements of the characters are picked up the moment they walk off the stage and their actions are followed wherever they may go. This too, has its limitations, of course, but it nevertheless points a way that will undoubtedly be followed. So far only one manager has seized upon the idea. In a musical comedy recently brought out, the leading lady announces at one point in the action that anyone who loves her will follow her and runs off the stage. The leading man straightway takes up the pursuit and so does the motion-picture machine. In natural colors the chase of the two through a piece of woods is faithfully produced. The chase continues for some moments and when the machine-made action finally fades away and the lights are turned up on the real stage again, the scene is found to be exactly as the last of the moving pictures showed it. The audience saw the leading man and woman disappear among the trees and another character come into view, and when the lights go up that character is seen standing there in the flesh—in this instance it happens to be the tenor—and he advances to the center of the stage and sings his ballad. The whole thing is so carefully fitted together that it created a sensation when first shown and, as stated, pointed out a way of emancipating the stage from the strongest bar to continuous and sequential action—which happens to be the stage itself.

IMPROVED BAGGAGE CHECK

A baggage check, embodying a number of new features which are expected to lessen the number of errors and complaints, has been adopted by the Pennsylvania Railroad. The duplicate portion of the new check is provided with spaces in which are printed a number of the principal "bad - order" conditions in which baggage is frequently received for checking. The duplicate check, when delivered to a passenger, will be perforated to show whether the piece of baggage is a trunk, suit case or valise, fiber case, or tool chest. Another perforation will show the condition in which it was received, whether the bottom, side, top, or end is broken; hinges loose, old or worn, or whether the piece of baggage is open.



FOREIGN

R. R. CO.
TAG CHECK

From

To

Via

JUNCTION POINTS

E 89-58-69

E 89-58-69

DUPLICATE CHECK

PENNSYLVANIA RAILROAD COMPANY

From

To

Via

Description and condition indicated by PUNCH MARKS

TRUNK ●	FIBRE CASE	BOTTOM BROKEN	SIDE BROKEN ●	LOCK BROKEN	HANDLE BROKEN	Old and Worn
Suit Case or Valise	TOOL CHEST	TOP BROKEN	END BROKEN	HINGES LOOSE	OPEN	●

Another feature of the new check is the location of the check number. This is placed at the bottom of the tag portion of the check, and at the top of the duplicate portion, so that the two can be readily matched when making delivery of baggage.

¶The electric company in Oklahoma City advertised a special sale of electric toasters by having a toast-eating contest for newsboys in the show window.

THIEF-PROOFING AN AUTOMOBILE

A Parisian chauffeur has invented a sort of combination lock for the fuel supply, which he believes will prove absolutely effective in preventing the theft of an automobile unless the thieves tow or cart the machine away.

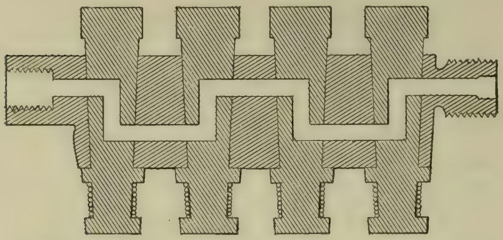


Diagram of the Interior Arrangement of the Combination Fuel Shut-Off

The device is inserted in the pipe leading from the gasoline tank to the engine, and consists of a casting containing four stop cocks, each of which bears certain numerals on the head. In order to admit gasoline to the engine, the heads have to be set to form a certain number. The canal through the locks is so formed as to prevent the finding of the proper combination by simply varying the setting of the end cocks, and the whole combination must therefore be known before the engine can receive fuel.

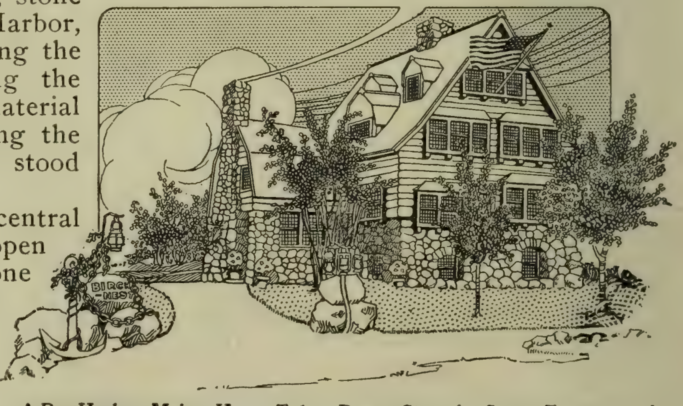
NEW GREAT LAKES STEAMER OF GREAT LENGTH

Longer than any transatlantic liner that flies the American flag is a steamer which has just been built for traffic on the Great Lakes to be operated by an American company. The steamer is the "Colonel John M. Schoonmaker," and is 617 ft. long over all, 33 ft. deep, and, with a draft of 20 ft., has a carrying capacity of 13,200 tons. In general, the design is similar to the modern type of Great Lake freighters, with pilot house well up to the bow, the engine rooms at the extreme aft, and a long sweep of hull between with 35 great hatches for loading and unloading cargo readily.

NEW ENGLAND HOME MOVED TO KENTUCKY

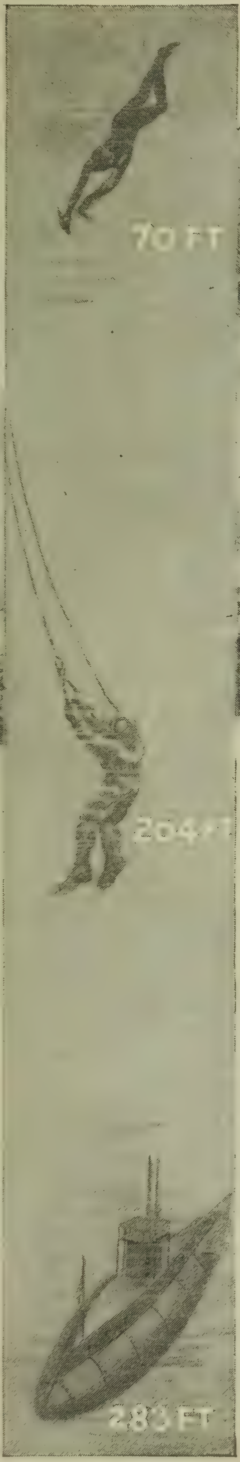
One of the most curious houses in Kentucky has been erected near Lexington by Douglas Sherley, who had the structure transported, stone by stone, from Bar Harbor, Maine. The cost of taking the house down, transporting the cobblestones and other material to Kentucky, and erecting the structure again just as it stood in Maine, was $20,000.

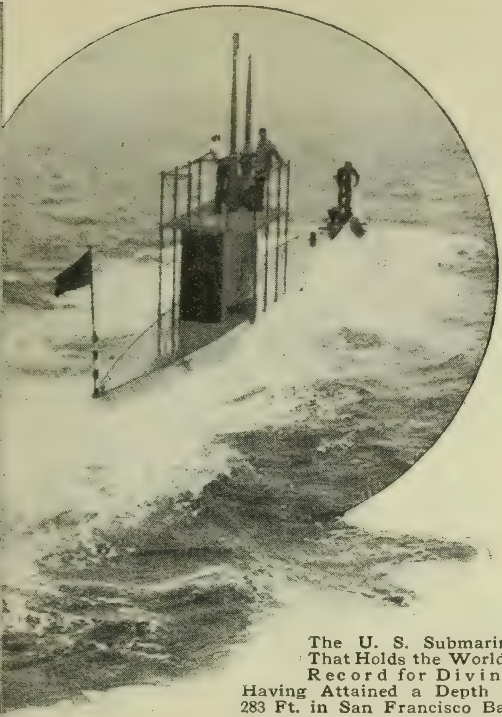
The old house has a central chimney from which open seven big fireplaces. In one corner of the reception room is a small fishing dory suspended by cables from the ceiling and fitted up like a couch, with cushions and pillows. At the entrance is a life-size plaster figure of a jockey, sitting with hands outstretched to receive the cards of callers. The big stones and anchors forming the gateway of the drive were also brought from Bar Harbor, where they served the same purpose.



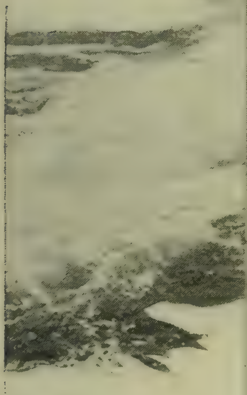
A Bar Harbor, Maine, House Taken Down, Stone by Stone, Transported to Kentucky, and Reconstructed Again

U. S. SUBMARINE BREAKS ALL DIVING RECORDS





The U. S. Submarine That Holds the World's Record for Diving, Having Attained a Depth of 283 Ft. in San Francisco Bay



The U. S. submarine "F1" broke all diving records recently by plunging to a depth of 283 ft. beneath the waters of San Francisco Bay. On board were Lieut. James B. Howell, in command, and a crew of 26 men. The little vessel remained down 10 minutes.

The United States navy has for some time held the record of depths attained by submarines. In April of this year the "F1" reached a depth of 200 ft. in San Francisco Bay while undergoing tests previous to acceptance; and last June the "Seal" descended to a depth of 256 ft. below the surface of Long Island Sound.

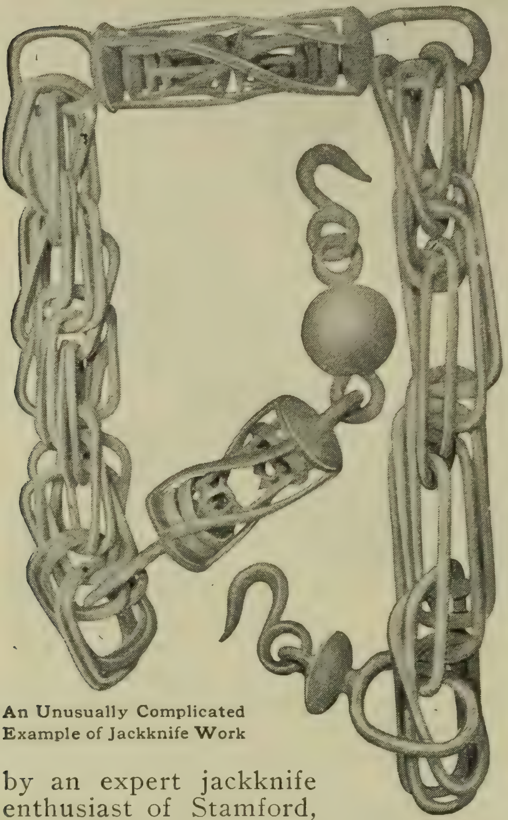
It may be possible that pearl divers and divers in rubber suits and brass helmets have descended to depths a few feet greater than those indicated in the illustration, but it is understood that these depths are records.

BERLIN HAS AN AMERICAN-TYPE FAMILY HOTEL

Berlin now has an "apartment" hotel, constructed on what its owners conceive to be American lines. But this is not all, for the owners, thinking to give it an unmistakable transatlantic title, have named it the "Boarding Palace," much to the disgust of the ultra-patriotic German press. The hotel covers an entire city block and contains more than 600 rooms, although only the statutory five stories in height. It will cater particularly to German families and bachelors, who do not wish to keep house or live in the ordinary boarding house, and to Americans who remain in Berlin for protracted periods.

A COMPLICATED "WHITTLED" WOODEN CHAIN

A complicated example of one-piece jackknife work, in the shape of a many-linked chain, was recently completed by an expert jackknife enthusiast of Stamford, Conn. The centerpiece, shown at the top of the illustration, consists of six hourglass frames nested in a space of 5½ in., with two solid balls in the center. The section at the right of the illustration comprises four single chains so interwoven that the whole forms one inseparable chain with fourfold links, while that at the left, otherwise similar in construction, consists of the interwoven links of six chains instead of four.


An Unusually Complicated Example of Jackknife Work

The complete piece is about 4½ ft. in length and 1¾ in. in diameter.

℄Scientists estimate the damage from smoke in America to be $600,000,000 annually.

MILLIONS SAVED BY A PIECE OF WIRE

Nearly one hundred pinnacle rocks, ancient wrecks, and other ocean-bottom obstructions, that have for centuries taken their toll of human life and dollars in ship disasters, have been discovered in the past few months by the United States Coast and Geodetic Survey at harbor entrances and in much frequented waters of the United States, through the use of the new wire drag, the invention of which was mentioned last spring in these pages.

This simple device, simple at least in its operation, has saved and will save uncounted millions of dollars, and numberless lives. Already it has been used to sweep the entrances to the Panama Canal on the Pacific side, in preparation for the opening of this great waterway, and one dangerous rock obstruction, heretofore unfound and uncharted, has been discovered. This was in the pathway of shipping through a main approach. Had it been found by the costly expedient of running a great ship upon it, the world might have had another horror.

Through the old method of sounding with a lead and line it was impossible to find rocks, wreck spars, and other similar obstructions, because the lead, even if it struck these bodies standing perpendicularly in the water, would slip from them and find the bottom level, maybe twenty or a hundred feet below. With the wire drag, even the point of an abandoned or lost kedge anchor can be found immediately. The new drag consists of a long wire carried horizontally through the water, and kept taut and evenly stretched at any given depth by an arrangement of weights and buoys.

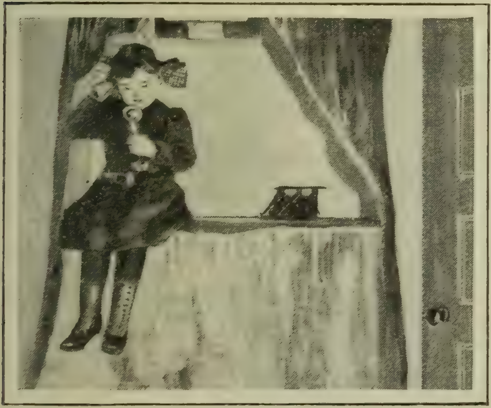
Before the advent of the wire drag, the annual average toll of the sea in ships was approximately 1,038—about 400 steamships and well over 600 sailing vessels. There is no accurate count of the lives and dollars lost. Vessels only damaged are not included in the list. How much of this has been saved or will be saved can only be estimated, but a fair example is shown in the harbor of San Luis Obispo, on the California coast. Though a heavy shipping point, this was one of the most dangerous harbors in the country, because of rock formations that lead and line failed to discover. It was "swept" with the wire drag, and every one of these dangers was discovered and charted. New charts have just been sent out by the government.

Last year the oil interests were very heavy losers through damage to ships striking rocks in this harbor, but since it was "swept" no loss from this cause has been reported. Just before the wire-drag survey in this harbor was completed, one vessel, the "Lansing," was damaged to the extent of $30,000.

It is estimated that a few million dollars a year will be saved in this and other ports by the use of the wire drag.

A LIVE-TREE DESK IN A POSTOFFICE

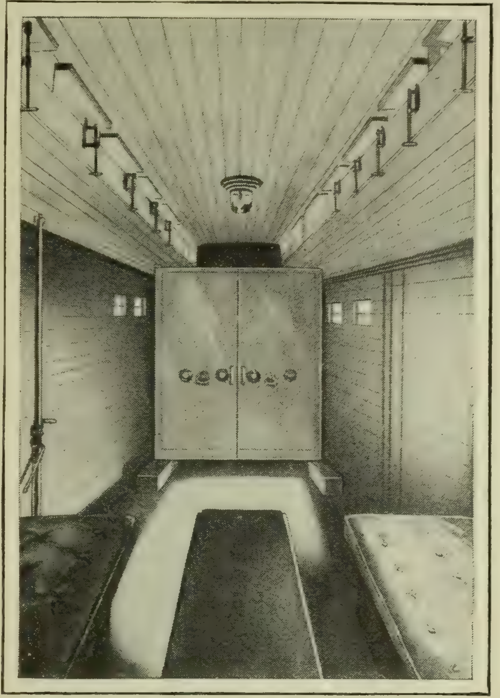
Rising through the lobby of the postoffice at Black Rock, Ore., is a big tree, in the trunk of which the postmaster had a notch cut of the kind made by woodmen in felling timber. This notch provides an excellent public desk. The postoffice is also the telephone exchange, and the little girl sitting on the desk with a telephone set in her hands is the daughter of the postmaster.



A Big Tree in the Postoffice of Black Rock, Ore.

"GOLD CAR" OF THE SOUTH AFRICAN RAILWAY

The output of gold from the Witwatersrand gold fields is so great that the South African Railway adopted a car of special design for its transportation between Johannesburg and Cape Town. The monthly consignment of gold weighs about 40,000 lb.



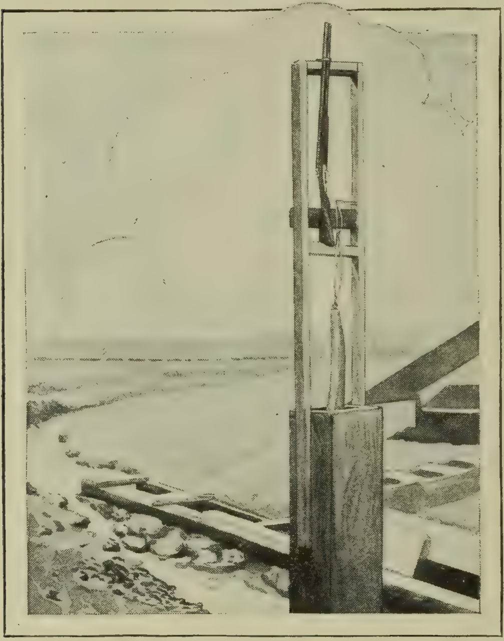
Interior of "Gold Car" on a South African Railway. The Safe is Raised above the Floor and the Space Beneath is Electrically Lighted. The Guard is Locked within This Car during the Entire Journey

The "gold car" contains a safe, supported above the floor on beams in such manner that there is an uninterrupted view between the floor and the bottom of the safe. As an additional precaution, this space is also electrically lighted. The elevating of the safe in this manner was due, it is claimed, to an experience of a regrettable nature. Several enterprising robbers slung themselves under the vehicle, and, while the train was speeding toward its destination, cut out the floor, drilled through the bottom of the safe, which was then resting directly on the floor, and got away with part of its contents.

When the gold car leaves Johannesburg, it is locked, with its guard as well as the gold inside. Comfortable sleeping accommodation and excellent cooking facilities are provided for the guard. The car is not opened again until Cape Town is reached.

SHOTGUN INDICATOR FOR IRRIGATION DITCH

A progressive farmer of the Hollister Valley, in California, wishing to cut down operating expenses as low as possible, installed an ingenious automatic shotgun alarm in connection with his irrigation supply ditch. The shotgun is mounted vertically on a supporting frame and its trigger is attached by a cord to a float in the ditch below. If, for any reason, the water supply drops below its normal level, the lowering of the float causes a pull on the trigger, and the consequent discharge of the gun notifies the farmer even though he be engaged at some distant corner of his farm. He thus saves the wages of an extra man to watch the irrigation supply.



Courtesy Journal of Electricity, Power and Gas

An Automatic Shotgun Arrangement to Give the Alarm When the Supply of Water Becomes Inadequate

FLIES THRIVE ON SOME DISINFECTANTS

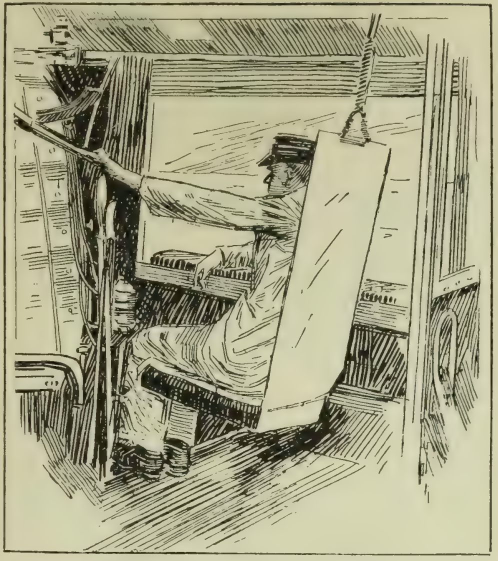
That flies really have as many lives as the proverbial seven of the cat is the assertion of a German scientist, and this does not seem unreasonable to one who remembers how, when a boy, he would pull off the legs, wings and other appendages of flies apparently without ending their lives. Prof. Eugene Korschelt of the Marburg (Germany) University, has recently discovered that a number of chemicals which kill most other animals, not only have no injurious effect on flies, but that these actually thrive in them. Such is the case with a 2-per-cent solution of chromic acid. Fly larvæ placed in this solution were seen to develop into winged insects, and when a sending of anatomical preparations, preserved in formaldehyde was received from Africa, the professor was surprised to find, upon opening the container, a number of full-grown flies that had developed from larvæ in this supposedly powerful disinfectant and germkiller.

PUMPING WATER BY SUN POWER

A sun-power plant is being erected at Meadi, near Cairo, Egypt, which will be used to pump water from the Nile to irrigate land in the vicinity. In Egypt both coal and other kinds of fuel are scarce but sunshine may be counted on throughout the year. If the sun-heat absorber proves efficient, other plants will probably be installed as an aid to the agricultural development of the Nile Valley. The device is similar to the one operating in Philadelphia, already described in these pages.

¶The first transcontinental journey of a motor truck was recently completed when a 5-ton truck, loaded with a consignment of soap from a Philadelphia concern, entered Los Angeles just 90 days after leaving Philadelphia. The truck averaged 45 miles a day during the trip.

CANVAS SEAT BACK FOR RAILROAD ENGINEER

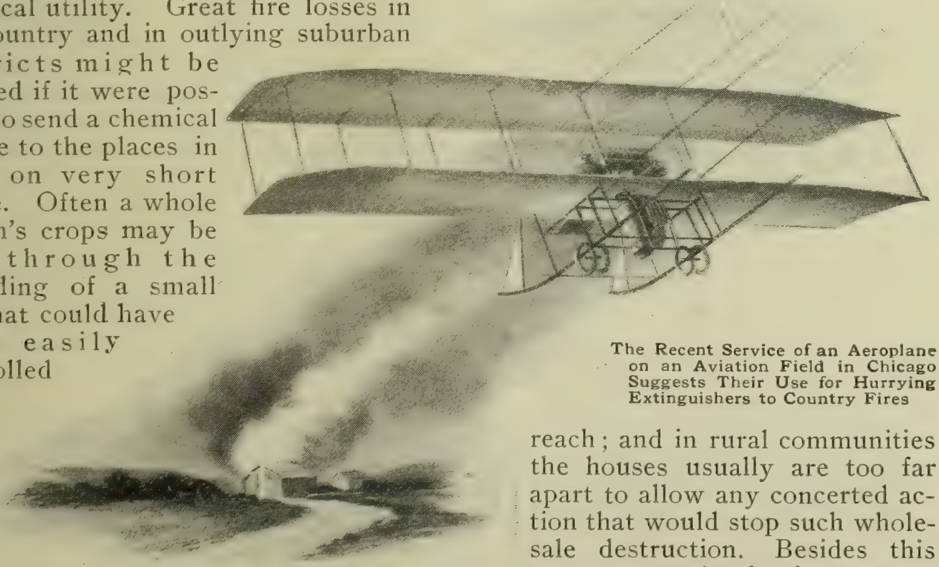


Locomotive Engineer Enjoying the Comforts of an Adjustable Back for His Working Stool

While there has been constant improvement in the construction of railroad locomotives with regard to speed, ease of handling long trains on heavy grades at top speed, etc., there has been little attention paid to the comfort and convenience of the man who works the throttle. Lately some thought has been given to him, however, and one of the newest things is a back for the engineer's seat which will relieve some of the strain under which he works. The back is a strip of canvas suspended from the roof of the cab by a strap, having a spring attachment to give it elasticity; the lower end of the strip being so arranged that a stitched fold passes down under the seat or the seat cushion, while the other end covers the top surface of the cushion and extends to the under side of the forward edge. This end and the edge of the fold that goes over the back are connected by means of straps which securely hold the strip in place. The seat backs are easily removed.

AEROPLANE USED AS A FIRE ENGINE

A speedy aeroplane equipped as a light chemical fire engine may be the next step in its development as a practical utility. Great fire losses in the country and in outlying suburban districts might be avoided if it were possible to send a chemical engine to the places in need on very short notice. Often a whole season's crops may be lost through the spreading of a small fire that could have been easily controlled at the start, had some fire-extinguishing apparatus been at hand or within reach; and in rural communities the houses usually are too far apart to allow any concerted action that would stop such wholesale destruction. Besides this use as an engine in the country,



The Recent Service of an Aeroplane on an Aviation Field in Chicago Suggests Their Use for Hurrying Extinguishers to Country Fires the chemical-engine aeroplane would be a godsend to aviators in danger of fire. Despite the most careful efforts of pilots, much oil will accumulate on the wings of a machine and because of the proximity of the gasoline engine there is constant danger of fire. An instance of this novel use of an aeroplane recently occurred at the Cicero flying field of Chicago, when one aviator used his machine as a fire engine to help a fellow pilot.

Max Lillie, a Wright flyer, while standing in front of his hangar, saw a biplane on the far side of the field enveloped in flames. He snatched up a fire extinguisher that was at hand, and, jumping into his aeroplane, reached the burning machine in about two minutes—in ample time to extinguish the flames before they had done much damage. The fire started when the pilot was 300 ft. in the air and was caused by a backfire from a cylinder that ignited the gasoline in the carburetor. The hastily improvised fire engine reached the burning aeroplane almost as soon as the machine reached the ground.

STORAGE-BATTERY TRAINS FOR CUBA

Three-car trains propelled by storage-battery power will soon be in operation in Cuba. The accompanying illustration shows one of the trains fully equipped and ready for the demonstration which took place recently in New York. The try-out of the train was made between the Pennsylvania station in New York City and Long Beach, Long Island, where an address was made by Thomas A. Edison, inventor of the storage battery used. The train was designed and developed for the United Railways of Cuba. Street cars of a type similar to those which will be used in the Cuban railroad service have been in operation for some time in a number of American cities, but this is the first instance of a railroad train being operated by storage-battery power, on the multiple-unit principle.

LARGE-MOUTH MAN CHANGES ENGINEERING RULE

A man with a large mouth was responsible for the fixing of the maximum size of stones to be used in macadam road work to 6 oz. John L. McAdam himself is the man who promulgated the first rules of road building and it was he who, coming in contact with a road worker having an abnormally large mouth, changed the rules to their present reading. In his early career McAdam insisted that stones used on his type of road should be small, and therefore made a rule that no stone should be used that would not go inside a man's mouth. One day, as he was watching a force of men working on a road, he observed that some of the stones used were altogether too large. He called the attention of the workman at that particular point to the fact, but the man said all the stones complied with the rule. When McAdam doubted his statement, this man, who had an abnormally large mouth, proceeded to put one of the largest stones in his mouth with perfect ease. The rule was then changed to the 6-oz. measurement, that has since prevailed.

¶The postmaster of Paris proposes to provide stamp moisteners for all postoffices in the city without expense to the government by allowing some person willing to install the devices to sell advertising space on the small desks that are to carry them.

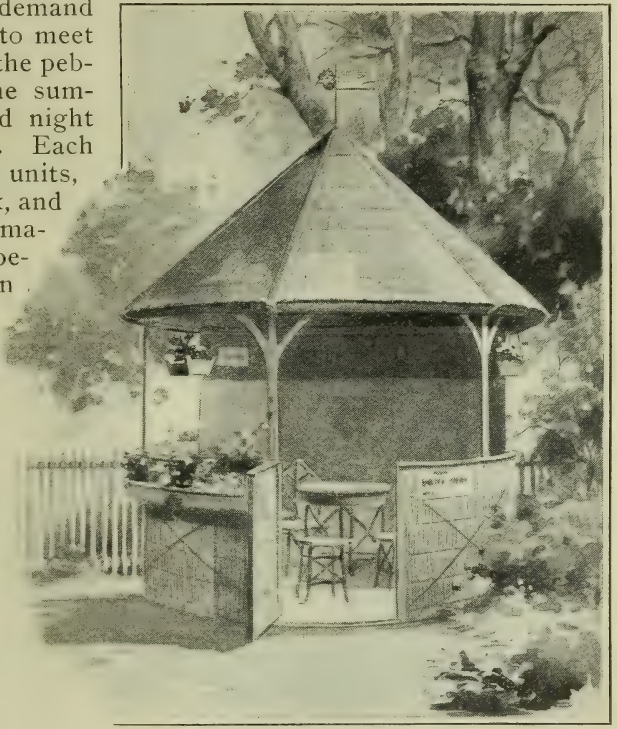
First Train Ever Operated by Storage-Battery Power will Become Part of the New System of the United Railways of Cuba

WORKING DAY AND NIGHT TO MINE PEBBLES

On the north shore of Lake Superior are found pebbles in large quantities which are of such uniform shape and size, besides having the desirable hardness, that they are in strong demand by cement grinders. In order to meet this demand, plants for mining the pebbles are maintained during the summer months which are worked night and day in two 10-hour shifts. Each plant consists of a number of units, mounted on a broad-gauge track, and moving ahead as the supply of material is exhausted; the units being capable of working over an area of about one acre a month. In the development of the beaches many difficulties were encountered. At first the pebbles were gathered by hand, but this was found unprofitable and the plants were installed. The sorting, bagging and handling is now all done by machinery. Pebbles are found not only along the present beach line, but also in a succession of terraces which extend about three miles from the lake, rising to an elevation of about 400 ft. above the normal level of the lake. These terraces are all former beaches indicating earlier lake levels and contain pebbles of the same material as those found on the present beach. Stocks of pebbles are shipped from various distributing points to all parts of the United States and Canada.

"BASKET" MAST IN SUCCESSFUL TEST

The skeleton or "basket" mast used on the U. S. battleships underwent what is said to have been a successful test recently. For the purpose such a mast was erected on the deck of the old "San Marcos" in Tangier Sound, in Chesapeake Bay. The mast was tilted about 15 deg. from the perpendicular, to simulate the effect of a ship's rolling and heavy weights were placed at its top to make the conditions still more unfavorable. The destruction of the mast required fifteen 12-in. shells, fired from the monitor "Tallahassee."



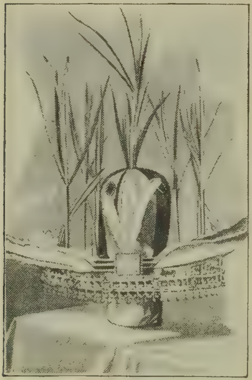
Sea-Grass Summer House Mounted on a Turntable

A GERMAN TURNTABLE SUMMER HOUSE

A type of summer house or garden pavilion which may be revolved so that its open side will always be away from the sun in hot weather, or facing the sun when the weather is cool, has become popular in Germany during the past season.

The conical roof and circular wall of the summer house is composed of a kind of sea grass which, when dry, resembles bamboo, although much smaller, being only from ⅛ to ¼ in. in diameter. This grass is a poor conductor of heat, and therefore affords a cool shelter. The little structure rests upon a turntable, which is operated from the inside.

AN AFRICAN POTENTATE'S CORONATION CROWN



The often exaggerated estimation placed by many, men and women alike, on things imported, whether hats and gowns "direct from Paris," men's furnishings from Bond Street, London, or automobiles or biscuits from somewhere else, is not altogether a characteristic of advanced civilization. An example in point is the accompanying illustration of the coronation crown of an African potentate.

This remarkable crown, if you please, was "imported" from England. It was made by a Liverpool firm for the king of somewhere or other in southwest Africa, and weighs in the neighborhood of 20 lb.

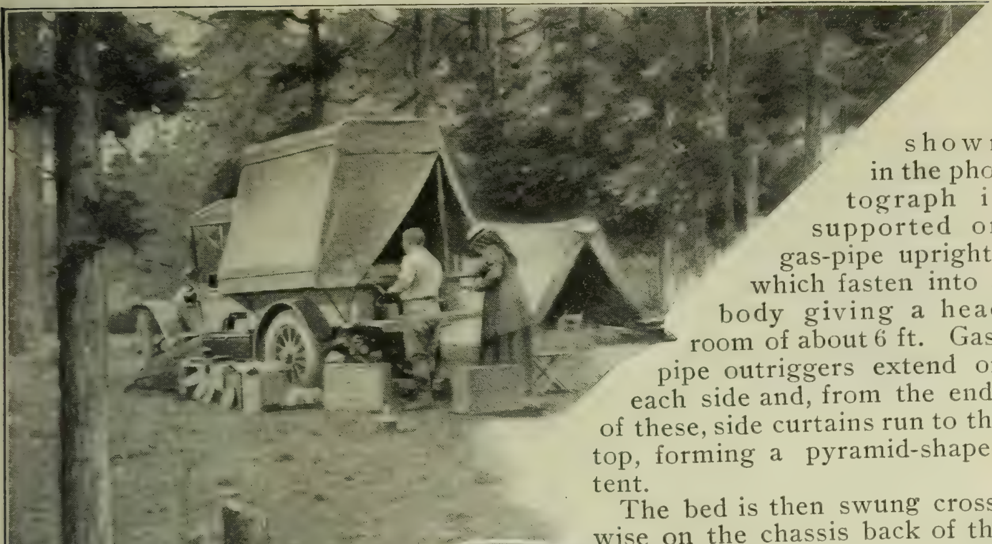
BIRD-CAGE DISEASE NOW AFFLICTS THE RACE

Those persons who have from time to time felt as they imagine birds feel confined to the narrow limits of their cages have at last been recognized by the medical fraternity and the "bird-cage disease" has taken its place on the list of ailments of humankind. At least such is the name given a species of nervousness caused by lack of exercise and a general "all-gone" feeling that comes to people, especially women, who seem to have lost all their sense of initiative and desire to do something or be some one. In a recent issue of Clinical Medicine, Dr. Maynard A. Austin gave this name to the ailment and in his discussion of the subject he intimates that his discovery is simply the name, that the disease is of long standing and is one of the penalties civilization has exacted. It was written long years ago that man would become weaker as he became wiser, Doctor Maynard asserts, and that civilization, while adding luxuries to everyday life, has given ample cause for the feeling that a high price has been paid for what gives comfort, convenience and enjoyment. Doctor Maynard seems to have been struck with the similarity of the condition of the bird in the cage to the sufferers who have come to him from time to time for relief. He calls attention to the fact that sometimes the feathered songster loses his voice and when the cause is sought, it is found in the fact that the bird has been treated too kindly, that it has been provided with every luxury and has grown sluggish and lazy. And he points out that this is just what happens to a number of people. Of course, it affects different people in different ways and gives rise to a variety of pains and aches that seem, at first glance, to have originated from totally different causes. When traced down, however, they all amount to the same thing, and the same kind of treatment, although not necessarily the same course or the same medicines, will bring relief in developing new energy and a desire to do. Exercise out of doors and a calm, even view of things is the thing that most such patients need and it is what Doctor Maynard advises — this, of course, after the positive symptoms, have been cured or allayed.

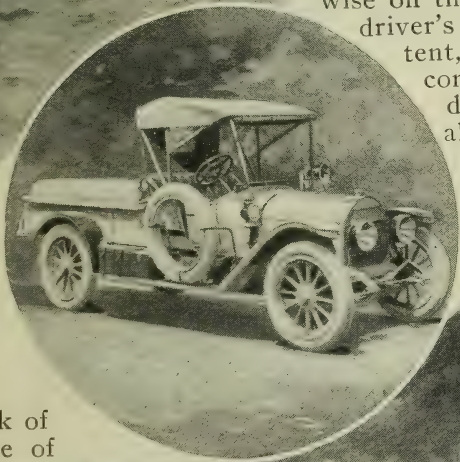
WOMAN TOURS ROCKIES IN MOTOR CAMP WAGON

A California woman, Mrs. A. J. Payson of San Mateo, this fall toured through the mountains of California, Idaho and Oregon, in a novel motor camp wagon, made and designed for her by a Wisconsin motor-car company.

This camp wagon is designed for extended touring over rough and wild country where good hotels are few and far between. The chassis is a one-ton truck, having a wheel base of 132 in., and the car is equipped with a 50-hp. engine. The seats are practically those



Camp Set Up, with Extra Tent

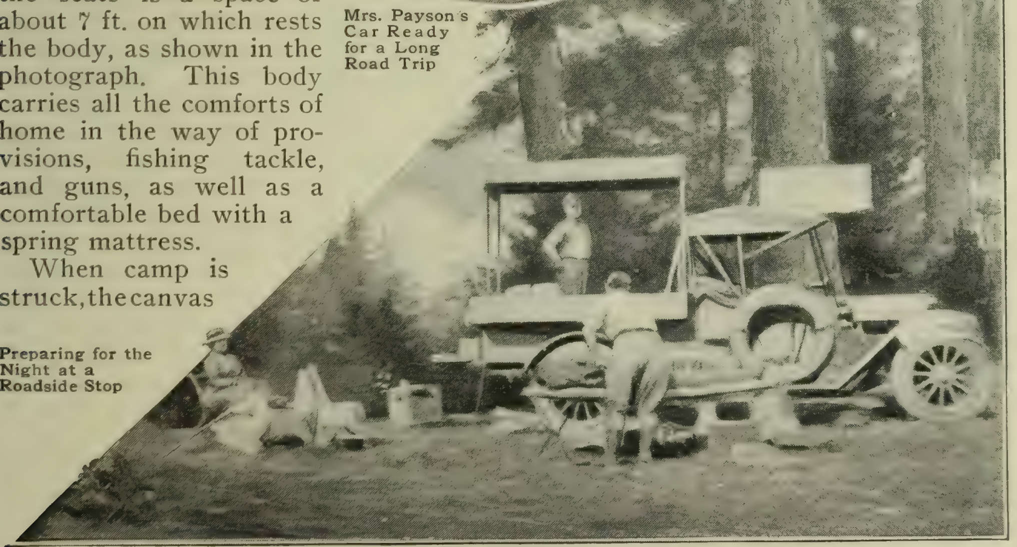


Mrs. Payson's Car Ready for a Long Road Trip

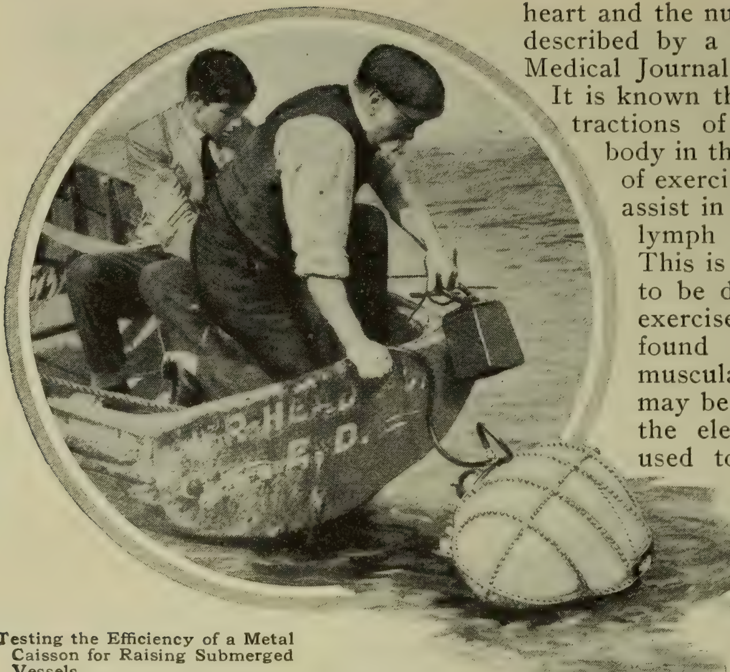
of a roadster. Back of the seats is a space of about 7 ft. on which rests the body, as shown in the photograph. This body carries all the comforts of home in the way of provisions, fishing tackle, and guns, as well as a comfortable bed with a spring mattress.

When camp is struck, the canvas shown in the photograph is supported on gas-pipe uprights which fasten into a body giving a head room of about 6 ft. Gas-pipe outriggers extend on each side and, from the ends of these, side curtains run to the top, forming a pyramid-shaped tent.

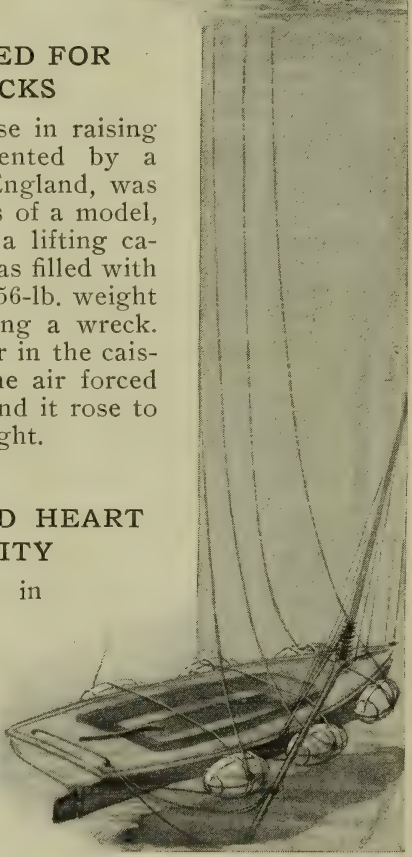
The bed is then swung crosswise on the chassis back of the driver's seat inside of the tent, making a very comfortable boudoir, electrically lighted.



Preparing for the Night at a Roadside Stop



Testing the Efficiency of a Metal Caisson for Raising Submerged Vessels



CAISSON DESIGNED FOR RAISING WRECKS

A metal caisson for use in raising submerged vessels, invented by a workman of Hornsey, England, was recently tested by means of a model, 2½ ft. long and having a lifting capacity of 115 lb. This was filled with water and submerged, a 56-lb. weight attached to it representing a wreck. In two minutes the water in the caisson was displaced by the air forced into it through a hose, and it rose to the surface with the weight.

TREATING A RAPID HEART BY ELECTRICITY

Electricity is applied in many forms in the treatment of disease. An interesting method of applying the electric current for the purpose of permanently reducing the size of an enlarged or dilated heart and the number of pulsations, is described by a writer in the British Medical Journal.

It is known that the voluntary contractions of the muscles of the body in the ordinary movements of exercise or the daily routine, assist in moving the blood and lymph through the system. This is one of the advantages to be derived from muscular exercise. Now it has been found that the involuntary muscular contractions, which may be produced by applying the electric current, can be used to great advantage in treating a rapid and dilated heart, to restore a normal heartbeat after shock, or even to cause the heart to beat when it has seemingly stopped from asphyxiation, drowning, or other accident.

Large electrodes are placed over the great voluntary muscles of the legs, thighs, back and abdomen, and the current is applied so as to make these muscles contract rhythmically. A metronome, an instrument used by musicians for beating time, may be used for timing the contractions when it is desired to reduce a rapid heart. The contractions are first timed a little slower than the heartbeats, and shortly these slow down and coincide with the muscular contractions. Then the latter may be made still less frequent, and so on, until the heartbeats are reduced to the normal rate. The pulse is at the same time made stronger and more regular, and the patient expresses a sense of well-being and rest, the effect lasting several hours after the treatment.

By continued treatment in this manner the heart gradually acquires normal or less irregular action, and a dilated heart becomes permanently contracted.

AEROPLANE ANCHORAGES THE LATEST

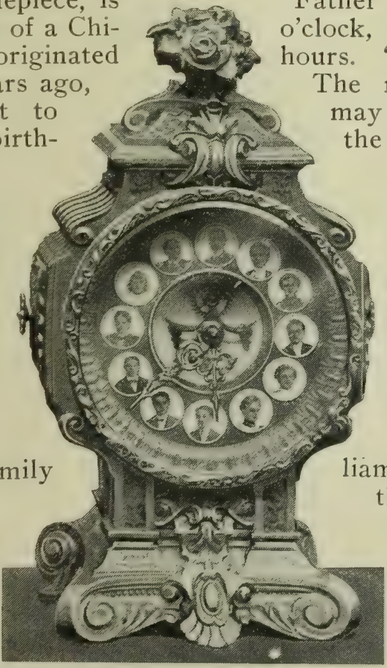
Now that aviation is becoming more and more a matter of everyday occurrence, many enterprising concerns about the English coast are making preparations for aeroplane garages and anchorages. The sign shown in the illustration has attracted considerable attention at Margate, and is an announcement "to all and sundry" that there is ample anchorage.

The "Aeroplane Yard" is Taking the Place of the "Coach Yard"

PHOTOGRAPHS TAKE PLACE OF HOUR NUMERALS

An interesting curiosity in the form of a clock, which serves as a family album as well as a timepiece, is to be found in the home of a Chicago family. The idea originated with the wife some years ago, when wondering what to give her husband as a birthday present. She first thought of a clock, then of an album, and a combination of the two was the result. The family at that time consisted of the father and mother, and ten children, so the numerals of the clock were replaced by photographs of all the family members.

Instead of telling the time as do other people, this family specify it by using the names of the children or the parents. Whenever the hands designate the midnight or the midday hour, it is exactly "Dad" o'clock. "Father and Anna" is one o'clock; "Father and Christiana" is two o'clock, and so on through ten hours. "Mother" is 11 o'clock. The minutes after the hour may also be told by using the names. The photograph taking the place of the numeral "2," for instance, is one of Christiana, and that of the numeral "3" is of William. Therefore, when the hour hand is over William, and the minute hand over Christiana, the time is "Christiana after William," or 10 minutes after three.



An Odd Timepiece and Family Album Combined. Photographs of the Family Members Take the Place of Numerals

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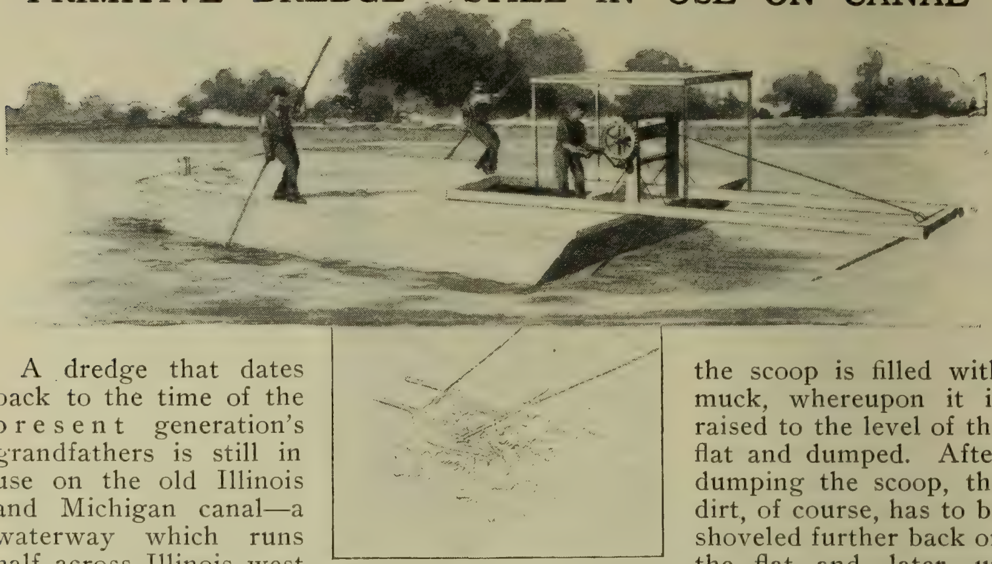
ℭThe French government is considering an appropriation of $50,000 to pay bounties of $400 each to French owners of fishing vessels carrying wireless.

PRIMITIVE DREDGE STILL IN USE ON CANAL



Primitive Dredge in Use on Illinois and Michigan Canal, a Scoop Bucket being Filled with Muck by Poling the Scow, after Which the Scoop is Hauled Up on a Windlass

A dredge that dates back to the time of the present generation's grandfathers is still in use on the old Illinois and Michigan canal—a waterway which runs half across Illinois west from Chicago—lack of funds for new equipment being responsible for its survival. It consists of a flatboat with a pair of beams extending beyond its bow. Mounted on the beams is a windlass to raise and lower the scoop, which is carried out toward the ends of the beams and dropped into the water. Then the workmen push the scow with poles and wind on the windlass until the scoop is filled with muck, whereupon it is raised to the level of the flat and dumped. After dumping the scoop, the dirt, of course, has to be shoveled further back on the flat and, later, up onto the bank.

Elsewhere on the canal modern steam dredges of 3-ton capacity are in use. The old dredge will be discarded soon, as the ancient waterway is being rapidly improved for the use of modern vessels.

ℭThe Aero Club of France has recently granted its thousandth pilot certificate.

IRRIGATION TERMS ARE OFFICIALLY DEFINED

"Second-foot," as defined by the United States Geological Survey, is an abbreviation for cubic foot per second and is the unit for the rate of discharge of water flowing in a stream 1 ft. wide, 1 ft. deep, at a rate of 1 ft. per second. It is generally used as a fundamental unit in measurements of stream flow.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

An "acre-foot" is equivalent to 43,560 cu. ft. and is the quantity required to cover an acre to the depth of 1 ft. The term is commonly used in connection with storage for irrigation work.

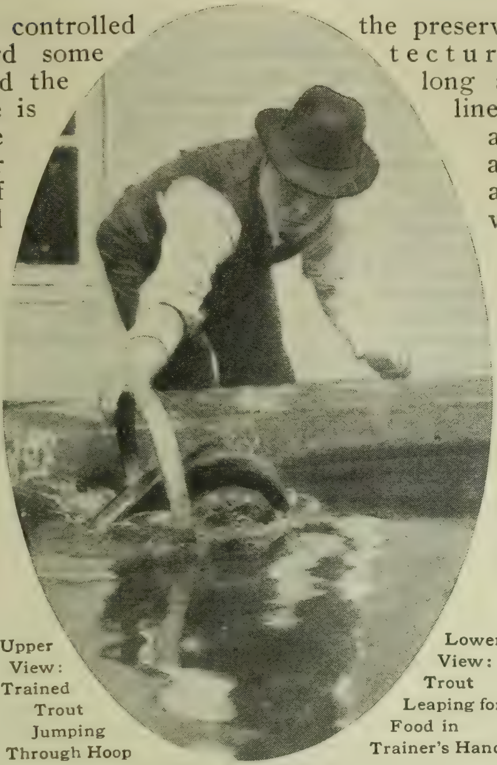
One second-foot flow equals 7.48 gal. a second, 448.8 gal. a minute, or 646,272 gal. in 24 hr. As a California "miner's inch" equals 0.187 gal. a second, there are 40 California miner's inches in one second-foot.

REGULATING MOTORS BY TELEPHONE

Any time the engineer in charge of the motors for driving pumps at the Fort Wayne electrical works desires to know whether or not they are running smoothly, he has the whir of the motors telephoned to him and so can determine for himself without making a personal visit. There are four of these motors, all controlled from a switchboard some distance away, and the engineer's telephone is on his desk at the switchboard. Near the commutator of each motor is placed a telephone transmitter. On starting a motor, or when regulating its speed, the switchboard engineer has plugged into his telephone the line from the motor phone, and listens to the pitch of the humming sound. A high pitch shows high speed, so that the engineer is able to regulate the speed by the sound he hears, practically as well as if he were using a mechanical speed indicator.

TROUT TRAINED TO JUMP THROUGH HOOP

Two "educated" trout live in a public fountain in Port Townsend, Wash. Their trainer, C. W. Lange, had the photographs reproduced herewith taken to show their tricks of feeding on salmon eggs from his hand and jumping through a hoop.



Upper View: Trained Trout Jumping Through Hoop

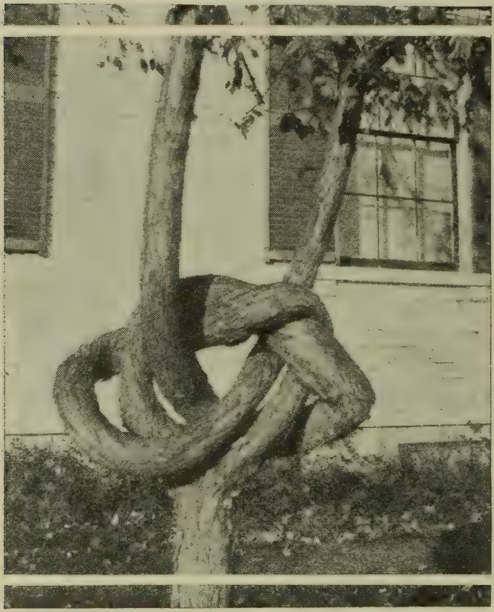
Lower View: Trout Leaping for Food in Trainer's Hand

PRESERVING ANCIENT PILES

Chemistry is finding a rather unexpected, but quite practical use as an aid of archæology for the preservation of the architectural masterpieces of long ago. In Dunfermline, Scotland, there are a number of ancient castles and abbeys that are visited by tourists, one in particular, the Dunfermline Abbey, which is almost a thousand years old. At least a portion of it dates that far back and other portions represent other periods from that time up to 1818. Tourists and the decay of age play havoc with the ancient piles, and the crumbling of the stone has been noticeable in some places. It is regarded as rather an odd thing that the 1818 section of this abbey shows greater signs of decay than the section that was erected in 1040 A. D. In the search for a method of preserving the stones, a chemist suggested that they be coated with a solution of silicate of soda, commonly known as water glass. The coating was put on after the stones had been thoroughly cleansed and as an additional precaution, a second coating was applied and to this was added a coat of calcium chloride. The effect was most satisfactory. The crumbling was stopped and it is now proposed to treat other places in the same way. It is estimated by chemists that one such treatment will protect the walls for about 40 years, when it will be necessary to repeat the operation. The materials required cost very little.

COMPLICATED KNOT TIED IN ELM TREE

An elm tree tied into a double knot near the home of Nelson Chapman in Fairfield is one of the curiosities of Maine. The tree is now about 15 years old, and measures about 6 in. in diameter at the base and 20 ft. in height.



Each Branch of the Elm Tree was Tied in a Knot, the Two Also Being Entwined

When the tree was small, Benjamin Taylor, who then owned the farm, set it out near the house where it now stands. At that time it was fork-shaped with two main branches growing straight upward. For the sake of variety, Mr. Taylor took one branch and tied a knot in it near the crotch of the tree. Then he took the other branch and tied another knot in a similar way, but entwined it through the first knot. Today the knots retain their form perfectly, and the tree is as thrifty as any elm and is growing fast.

LIGHT-WEIGHT HIGH-SPEED TURBINES

A type of turbine, which the inventor believes would give the American battleships the same speed as at present, and at the same time allow for two more big guns, with additional armor plating and store of ammunition, is announced by George Westinghouse as now being designed. He has found that, by properly constructing a high-speed turbine with a novel governing apparatus for admitting steam to the nozzles of the impulse part, a water-rate economy for cruising speeds can be attained, vastly superior to that of any other type of marine engine, reciprocating or turbine.

The American battleships of the "Florida" class are now fitted with eight turbines, having, combined, 850,000 blades, which would reach a distance of 40 miles if laid end to end. In the new engine, with reduction gears, there will be required only four turbines having less than 60,000 blades, the length of which, placed end to end, would be only two miles. These turbines and gears would perform the same amount of work as the eight turbines of the type at present installed, which weigh 2½ times as much.

SOUNDPROOF WALLS FOR TELEPHONE BOOTHS

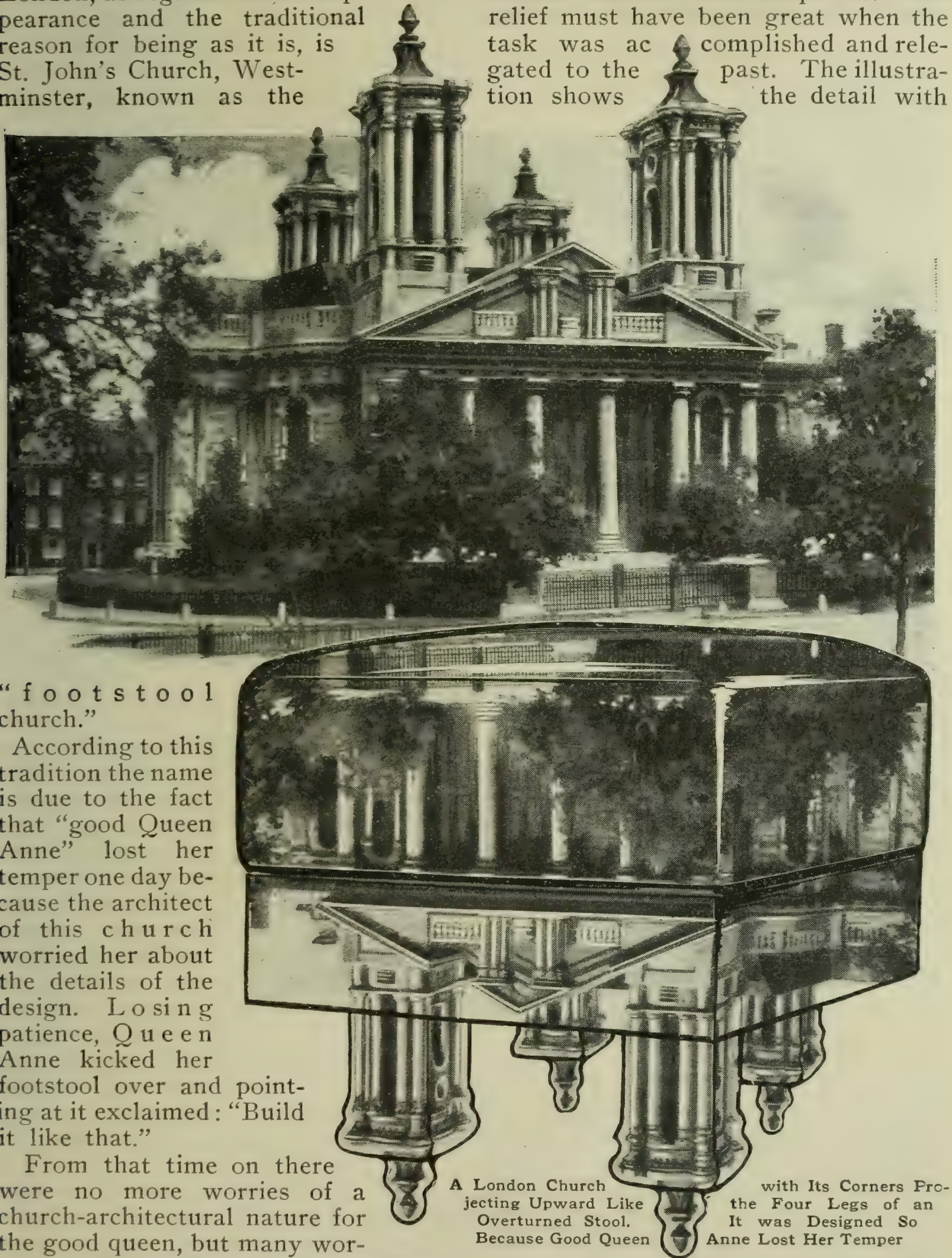
A telephone booth, claimed to be absolutely soundproof, has been recently put on the market by a German cabinet-making concern. Its walls are constructed of five layers of thin wood, laid upon each other crosswise and glued together, a sheet of sound-insulating material being placed between each layer of wood and on the outside and inside. This manner of construction does away with the cushions ordinarily used on the inside. The booths can be disassembled into six parts for transportation up narrow stairways, and are provided with insulated passages for telephone and light wires, so that there is no need of piercing the walls.

QUEEN ANNE'S CURIOUS "FOOTSTOOL" CHURCH

One of the most curious churches in London, as regards both its appearance and the traditional reason for being as it is, is St. John's Church, Westminster, known as the "footstool church."

According to this tradition the name is due to the fact that "good Queen Anne" lost her temper one day because the architect of this church worried her about the details of the design. Losing patience, Queen Anne kicked her footstool over and pointing at it exclaimed: "Build it like that."

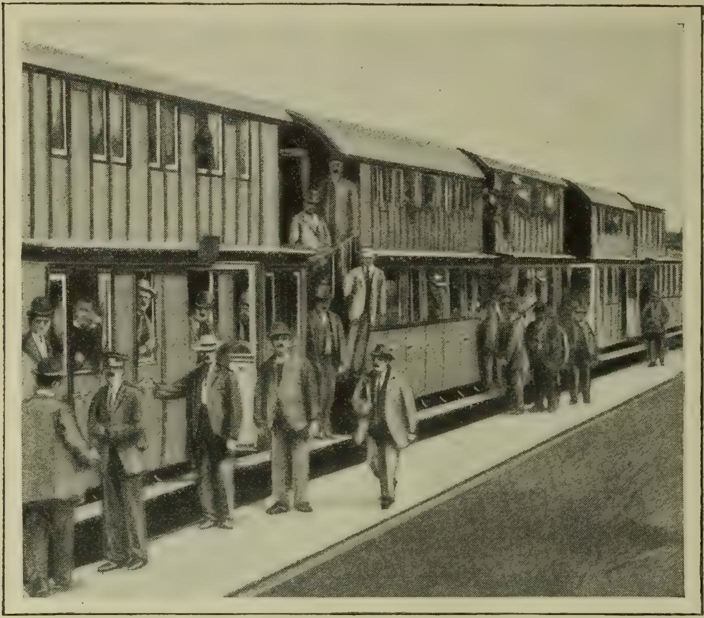
From that time on there were no more worries of a church-architectural nature for the good queen, but many worries and forebodings for the architect. Who was he, to presume that her exasperated outburst was not meant to be taken literally? So he designed it accordingly, the corners projecting upward like the four legs of an overturned footstool of that period. His relief must have been great when the task was accomplished and relegated to the past. The illustration shows the detail with which the queen's command was carried out.



A London Church with Its Corners Projecting Upward Like the Four Legs of an Overturned Stool. It was Designed So Because Good Queen Anne Lost Her Temper

A DOUBLE-DECKER TRAIN FOR WORKMEN

The Berlin City Railway Company operates a train of double-decked coaches between a section of Berlin, inhabited mostly by workmen, and its own shops, for the sole purpose of taking its employes to and from work.



A Special Double-Decker Workingmen's Train in Berlin

The Berliner Illustrirte Zeitung, by whose courtesy the illustration is reproduced, complains because double-deckers are not used for all trains. It is to be presumed, however, that the paper has in mind a type of double-decker different from those shown, which are certainly not built for comfort.

ⒸFire Commissioner Cole of Boston, believing the boy-scout movement can be used as an educational force to reduce the fire hazard, advises that all boy scouts learn the number and location of the fire-alarm box nearest to their respective homes, and that they make sure, also, that the rest of the family know it.

STEEL SPRINGS IMPORTANT TO THE WHALER

One of the most curious mechanical features of a whaling ship is the device used to relieve the strain from the harpoon line when going after whales that show fight and must be played in much the same manner as a fisherman plays a trout or salmon. This consists of a double row of steel springs attached to the keelson of the whaling ship and connected to heavy blocks or pulleys by a stout steel rope, the blocks being suspended above the shrouds of the foremast. The line from the harpoon is passed through the blocks and around a winch. The whale is harpooned and then the work of bringing it to the side of the ship begins. While whale lines are very strong, the strength of the whale is much greater than any line practicable for the purpose could be made, so that if the whale is not killed outright and shows fight, it is necessary to play him and this, of course, brings a very considerable strain on the line. If there were not some way of relieving this direct tension, the line would snap. The same tension is felt in the case of a certain sort of whale which sinks when it is killed. The strain is then caused by the rise and fall of the ship on the waves as the carcass is being hauled in. The springs take up this strain and give the line so great a flexibility that breakages rarely occur.

ⒸThe French army is using 63 special motor trucks for the transportation and housing of aeroplanes, and for the transportation of mechanics and spare parts.

COLOR SCHEMES TO MARK AUTO ROUTES

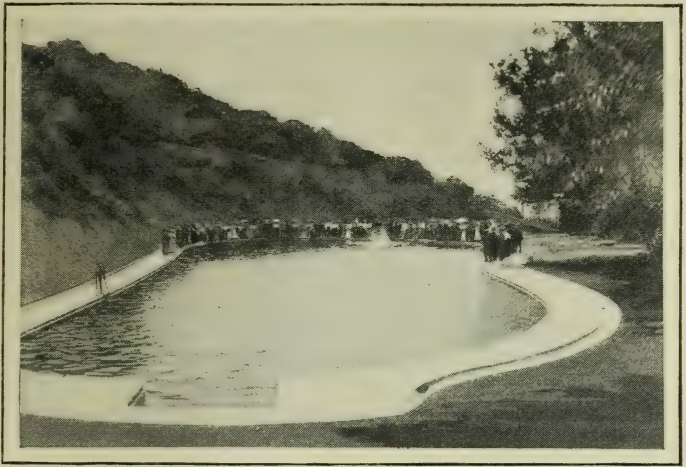
Automobile touring routes through New York State are to be marked by color schemes, in order to make the routes readily recognizable. The route from New York to Buffalo, through Albany, for instance, is to be marked in blue, with fences, bridge approaches and signs on the proper highway displaying this color. The suggestion was advanced by an automobile-association official, and adopted by the state highway department. Red will be the color of the route from New York to Jamestown by way of Binghamton; yellow will mark the route from New York to the Canadian border, at Ogdensburg; green is for the trip from Binghamton to Niagara Falls and Ogdensburg, and brown from Oswego to Syracuse and Binghamton.

NEW PAIN ERADICATOR FOR DENTISTRY

A mixture of "laughing gas" and oxygen that makes dentistry painless, without depriving the patient of consciousness, is one of the discoveries announced by the mouth-hygiene section of the National Hygienic Exposition. The new discovery is classified as an "analgesic," and it is said to dull all sense of pain without affecting any other sense. The analgesic treatment consists in applying nitrous oxide, or laughing gas, to prevent pain, while at the same time oxygen is administered to keep the patient conscious. If the patient shows signs of pain, a little more laughing gas is added to the mixture, and signs of approaching unconsciousness are the signal for a larger proportion of oxygen.

SWIMMING POOL USED FOR FIRE PROTECTION

The State University of California has recently constructed a tank of water that is primarily a swimming pool and incidentally is so situated that the water can be used for purposes of fire protection in time of emergency. The pool, which is of irregular shape and built of concrete, is located in a small canyon back of the university campus. Means are provided so that the water can be let out in a continuous stream from the bottom of the tank and connect with the regular water mains.


View of the University of California Swimming Pool at Berkeley

SCOUTING HYDROPLANES TO HAVE HOME

The use of hydroplanes of great speed for navy scouts has appealed so to the British admiralty that a hydroplane station is to be built at the Firth of Forth on a promontory known as Carlin's Nose. This promontory commands a complete view of the Forth, and from the station there the hydroplanes could hurry out on scouting duty, with the advantage of being at the most convenient place just when they might be needed to get reports of the character of approaching warships.

MAKING ENGINEERS OUT OF SAILORS

By JOHN R. COX

The latest addition to the practical-training system of the navy is the machinist's school, at Charleston, N. C. True, there has been, for some years, a school at Norfolk, Va., for the instruction of men in the engineers' force, but the advantages of this school were limited to those men and then only upon re-enlistment.

The new school, on the other hand, is open to any enlisted man with mechanical aptitude, under 29 years of age, if he has served four months in a cruising vessel, the only other qualifications being a good record, and an indication of sufficient intellect to learn what is taught him. On August 1 of this year, the school graduated its first class of 62 men. Thirty-eight states of the Union were represented in the class; a youngster from Atlanta standing No. 1, with a young man from Michigan a close second. Early this year the school at Norfolk was moved to Charleston and consolidated with the already thriving institution there, and in the future all instruction for the machinists rating will be conducted at the southern station.

The shop, operated in connection with the school, is housed in the largest and most expensive building in the Charleston yard, costing about $500,000. The machinery installed covers about 33,000 sq. ft. of floor space, and consists of 65 lathes, planers, shapers, drill presses, milling machines and boring mills, 26 machinists' workbenches, 3 copper and tinsmiths' benches, 2 blacksmiths' forges, with a complete supply of tools and spare parts. The tools are all furnished by the government. There are also numerous types of auxiliary machinery used on board naval vessels, such as ice machines, pumps, air compressors, and the like. The main engines of the old torpedo boat "Ericsson" were removed bodily and set up on reinforced foundations in the shop. The first cost of the machinery was nearly $200,000, and the stock and hand tools represent an annual expense of $3,600. The power alone used in the school costs about $3,000 a year. The school is divided into four classes, a new class being received every four months, and another class being graduated at the same time. There are at present over 200 men in attendance, the average age being 23.

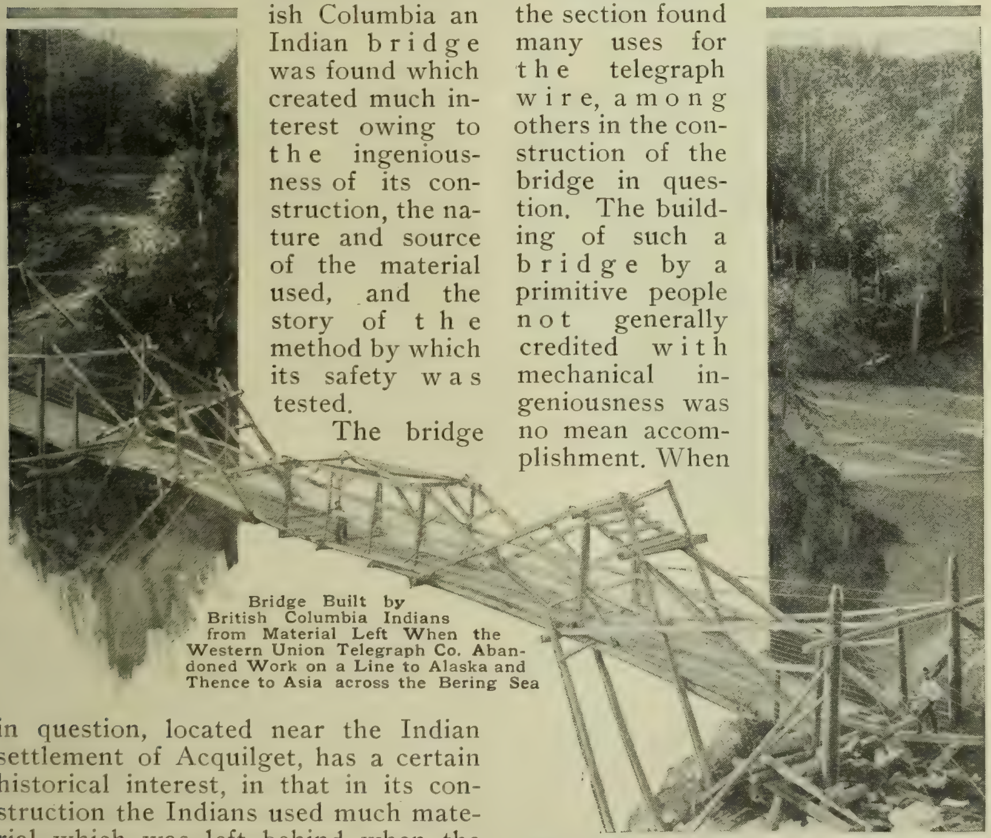
A complete course of instruction extends over 16 months, divided into four-month periods, of which the first is devoted to instruction in mathematics, nomenclature and spelling; while the practical work consists of chipping and filing, drilling and tapping, pipe fitting, sketching and foundry work, as well as the rudiments of copper and tinsmithing, brazing and babbitting. During the second four months, the class has various exercises on lathes, shapers and planers and a thorough course in the model engines. The next period is spent on the torpedo boats at the yard, where practical experience is obtained in the operation of the vessels' machinery, all repair work being done by the men of the school. For the fourth period the men are brought back to the school shop for an advanced course in boring-mill, milling-machine and lathe work. Lectures are given every night except Saturdays and Sundays, during the entire 16 months. These lectures are altogether practical and discuss every fault of ship machinery, and the remedy to be applied.

Very little theory is taught. The school is essentially one of practical training. Marine engineering is recognized as a wide and comprehensive subject. Nevertheless, a great deal can be learned in a 16-month course—equal to two years at a university. The brief career of the school has demonstrated that the bluejacket-student will absorb sufficient of the theory of his profession to work intelligently. Men ambitious to become engineers are offered every encouragement, and many facilities. A technical library has already been formed, and additions are being received from time to time. Eventually it will be developed to a high degree of excellence, affording the enlisted student unlimited facilities for mastering his profession. Even now, it would surprise most people to know how deeply some of the boys dig.

While the course of this school is far longer than that of any other navy training school, it is made necessary by the varied and specialized knowledge required of marine engineers, in order to measure up to the standard of naval efficiency. Sixteen months cut a considerable slice off a four-year enlistment, and the school affords an illustration of what the navy means to the industrial development of the country, when it is remembered that there is no obligation upon the men to remain in the service beyond one enlistment.

SQUAWS USED TO TEST STRENGTH OF BRIDGE

During the preliminary work incident to the construction of the Grand Pacific Railroad through the middle section of British Columbia an Indian bridge was found which created much interest owing to the ingeniousness of its construction, the nature and source of the material used, and the story of the method by which its safety was tested.



Bridge Built by British Columbia Indians from Material Left When the Western Union Telegraph Co. Abandoned Work on a Line to Alaska and Thence to Asia across the Bering Sea

The bridge in question, located near the Indian settlement of Acquilget, has a certain historical interest, in that in its construction the Indians used much material which was left behind when the Western Union abandoned work on the telegraph line that was to penetrate Alaska, cross the Bering Sea and connect with the Russian line in Asia. This work was abandoned when the Atlantic cable was successfully laid.

The Indians of the section found many uses for the telegraph wire, among others in the construction of the bridge in question. The building of such a bridge by a primitive people not generally credited with mechanical ingeniousness was no mean accomplishment. When the bridge was completed, however, serious doubts as to the strength of the structure, and particularly of the slender wires, were entertained. After many councils among the chiefs to determine just how the safety of the bridge could be best determined, it was decided to send 15 of the fattest squaws out to the middle of the bridge there to perform a dance. This was done, the bridge withstood the test, and the males of the tribe hesitated no longer.

"WHISTLING" GOPHER PHOTOGRAPHED

This gopher, standing straight up and just ready to whistle, was photographed a moment after it emerged from its hole. The camera was placed 3 ft. from the hole, and 50 ft. of wire was attached to the shutter. When the gopher was seen to leave its hole the photographer pulled the wire.

A Gopher, Standing Straight, and Ready to Whistle

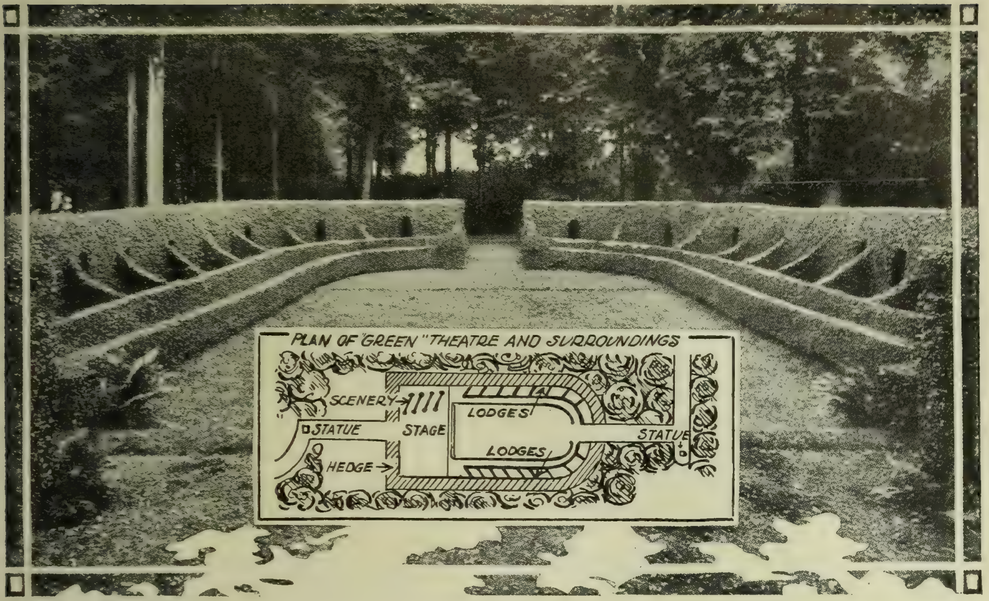
THE "SKY LEASE:" A UNIQUE DEAL

What is known as the "sky lease" in Cleveland, Ohio, is one of the most curious building-space leases ever drawn up in America. Some time ago a frontage of 150 ft. on Euclid Avenue was leased for a term of 99 years, and the lessee erected a six-story store and office structure having foundations strong enough to carry several additional stories. After the building was completed, the owner leased the air space above the sixth floor, and the support of the walls and columns of the six-story structure to the Cleveland Athletic Club.

The Cleveland Athletic Club then added seven stories to the six-story structure at a cost of more than $500,000. The club pays a fixed annual rental for its "air space," along with entrance space for the elevators and a space in the basement. The seven top stories are, of course, owned by the athletic club, and at the termination of the lease, which will run for about 90 years, the owner of the fee agrees to pay the appraised value of the improvements, or extend the lease for another period of years.

GREATEST COLLECTION OF GRAPHIC ARTS

What probably is the most complete collection of its kind in the world is now being installed in the Smithsonian Institution in Washington. It forms a history of the graphic arts, beginning with the earliest forms of Chaldean cuneiform and Egyptian papyrus writing down through the ages of Japanese color work, medieval illumination, wooden-block printing, engraving, lithography, and monotype work, to the most modern forms of depicting ideas on paper. Hundreds of magnificent specimens of the bookbinder's art of the present and of earlier days are in the collection, which will occupy the entire building used by the National Museum until the completion of its new building.



Courtesy of the Sketch

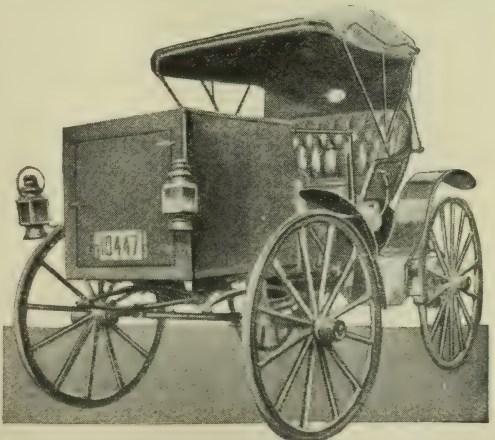
View from the Stage of Theater Formed of Shrubbery, in Grounds of Belgian Castle, with Plan of the Theater

OPEN-AIR THEATER FORMED OF CLIPPED SHRUBBERY

Attached to a castle near Sottegem, Belgium, is a beautiful outdoor theater formed of the hornbeam, a small tree, commonly used for hedges and having short, smooth, often twisted trunk and branches with rough, alternate leaves. It is known as the "Theatre de Charmilles," and dates back to the eighteenth century. Famous actors of the past have appeared upon its stage. The entrance to the circle of boxes is through arched openings cut through each box section at the back. The partitions of the boxes, as well as the back and front walls, are composed of clipped trees.

GAS REPLACES DOBBIN IN FARMER'S CARRIAGE

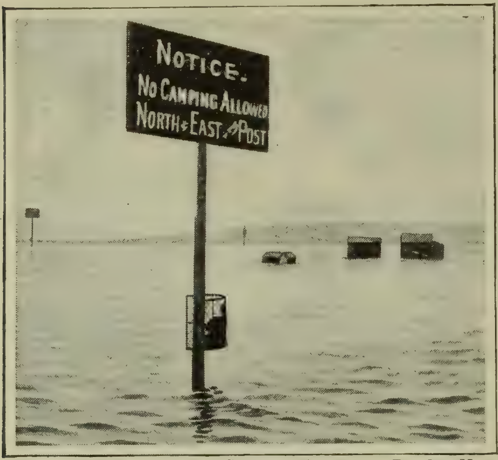
When the craving for an automobile hits the farmer there is nothing that will stop him—not even the lack of money with which to buy one. Of late there have been few, if any, farmers without money in plenty to spend on speed wagons, but there have been some whose life-long thrift would not permit them to invest in a motor car. These have, in some instances, evolved schemes to permit the hitching of an engine, in place of old Dobbin, to the family carryall or sidebar buggy, the result being a lot of vehicles that have a most curious appearance but "get there just the same." The latest instance of the conversion of the old family carrier into an automobile comes from a small town near Cincinnati, Ohio. The farmer in this instance was also a blacksmith. He installed a gasoline engine of 14 hp. in front of the



The Family Carriage of an Ohio Farmer Which was Converted into an Automobile dashboard of his buggy and by a series of gears transmitted the power to the wheels. The gasoline tank is placed behind the seat.

A "KEEP-OFF" SIGN THAT BECAME A JOKE

What a London journal calls "Neptune's little joke" is shown in the accompanying illustration. It is one of several signboards notifying prospective users of the camp lands at the edge of the sea at South Shields that they must not pitch their tents in a certain direction from the post. The joke of Neptune was an exceptionally high tide, which not only inundated the prohibited area, but swept a number of summer houses and tents from legitimate camping locations.



Courtesy Illustrated London News

A Warning Rendered Superfluous by an Unusually High Tide

SKIN DISEASES TREATED BY ELECTRIC DRYING PROCESS

The mystery of the nature and origin of electricity is only exceeded by the widely differing effects which may be produced by administering it in its many different forms in the treatment of disease. From its application by the old-fashioned "shocking machine," to desiccation by high-tension discharges is a long step.

As the name indicates, it is a drying process. The electrical discharges used are produced by a static machine of large capacity, the electrodes of which are so constructed as to give, instead of one large spark, a number of tiny sparks, which are not hot enough to carbonize or burn the area of skin where the electrode is applied, but only to cause a rupture of the tissue-cell membranes and a rapid extraction of the water, converting the area treated into a dry mass or crust under which the tissues heal rapidly. When properly applied, the method is not painful, but a local anesthetic may be used if necessary. For superficial destruction it is not necessary to apply the bare electrode to the skin, this being required only in the treatment of more deep-seated affections.

The method of desiccation was devised by Dr. William L. Clark and may be applied to the cure of lesions on the surface, such as warts, moles, pigmentations, birthmarks, ulcers, and the like, as well as in the treatment of granulated lids, pimples, skin cancers, and for the removal of tumors in the throat, the bladder, or other cavities of the body.

SHADE TREES GROWN UPSIDE DOWN

A Maine railroad company has solved the problem of growing good, even if small, shade trees in a short time, the result of the method adopted

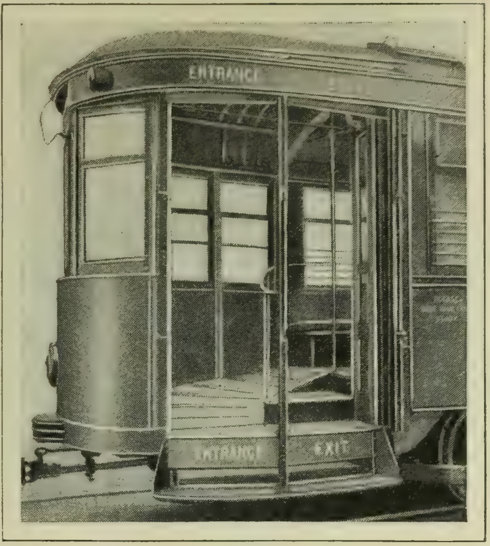
Shade Tree Whose Branches Originally were the Roots of the Tree being that after two years these trees give as much shade as could be provided by trees grown in the ordinary way first when they become 15 to 20 years old.

For the purpose small elm-tree saplings are preferably used. The sapling is dug out with all the roots, but is set out with the top part in the ground, and the roots in the air. This topsy-turvy mode of planting does not seriously affect the growth: Roots soon form on what was before the top of the tree, and the original roots, that now take the place of the branches, begin to leaf out and form a complete blanket foliage, making a fine canopy. Trees so grown can be found at Waterville and Fairfield, Maine.

SWISS WOMEN SELL HAIR TWICE YEARLY

Trade in human hair is a big industry abroad, exports sometimes reaching a total of $3,000,000 to $4,000,000 a year. Italian merchants lead in the trade and obtain a large part of their stock from the peasant women of Italy, Switzerland and Dalmatia. A peculiar method is in vogue among the women of these countries in order to produce a supply of hair regularly, and yet not appear to have been "shorn" at all. They cut off half of the hair at the back of the head and then twist the remaining half over the exposed part and dress it in such a manner that the loss is not discernible. Twice a year the agents of the human-hair merchants come around for the semiannual crop of hair thus raised.

AN INCLINED STREET-CAR ENTRANCE



Street Car Provided with an Inclined Passageway or Ramp Instead of an Inner Vestibule Step

A new way of obtaining a low step for street-car entrances without lowering the body of the car or using two steps, has been worked out on the new cars of the Kansas City street railway. The floor of the rear vestibule is a foot lower than the floor of the body of the car, but the passengers, on stepping into the vestibule, land on a ramp or inclined passageway which rises to the main floor. Safety treads provide a secure foothold, and handrails are provided on both sides.

"HANSOMETTE" DRAWN BY GOAT

Seeing that the English call the small types of automobiles "motorettes," it will not be amiss to call the miniature hansom here illustrated a "hansomette." The quaint little vehicle and the goat that draws it, belongs to a little London girl. The diminutive cab was designed by the child's father.

The Goat-Drawn "Hansomette" of a Little London Girl

Photo by H. B. Phelps, Cleveland

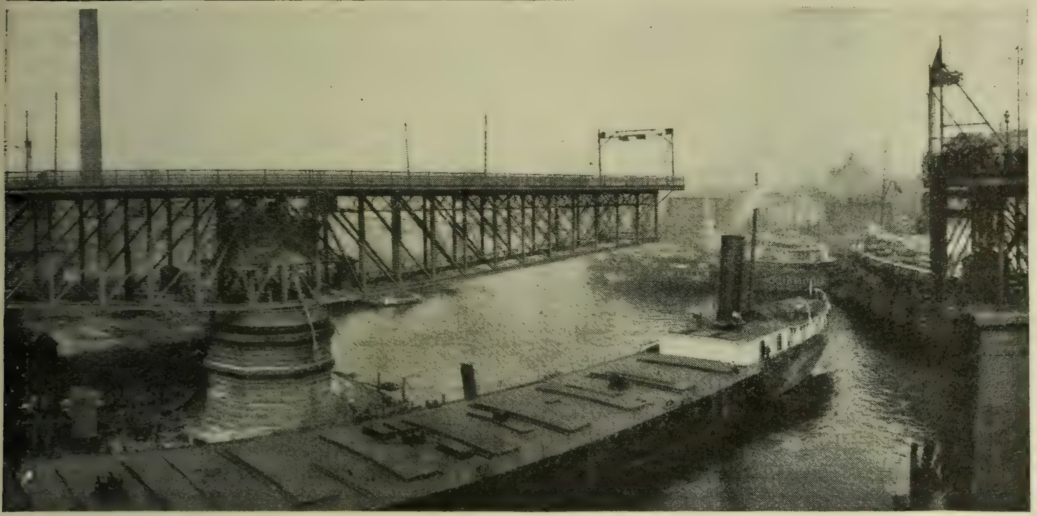
"The Dachshund of the Great Lakes," Freight Steamer "Gilchrist", Passing under
Being Due to the Taking of the

PUTTING FIGHT INTO PEACEFUL NITROGEN

Many of the scientific and mechanical methods and devices in almost universal use today are based on simple discoveries which at the time seemed to have no general application and which scientists alone hailed as remarkable. A comparatively simple discovery just announced by a British physicist is being called by scientists one of the most remarkable achievements of the present time, and quite likely to develop into applications of important everyday utility. They cannot see, as yet, the final use of the idea, but they see great possibilities in it, as did scientists when the X-ray and radium were first announced. In simple terms, the fact has been established that nitrogen, which has always been known as an inert gas, a quiet, well-behaved and sleepy matter, can by means of a heavy discharge of electricity through it, be made an extremely active, busy and aggressive substance. A striking feature of nitrogen gas so treated is that it gives out a glow and that the colder the gas is, the brighter the light.

The air is almost entirely made up of two gases, oxygen and nitrogen, containing about 20 per cent of oxygen, and 80 of nitrogen. Now, oxygen is a very active gas. Wood, coal, or any other combustible substance will burn in the air by uniting with the oxygen present in it. Even iron will burn in a gas which is almost wholly oxygen. It is the oxygen in the air which supports the life of animals.

On the other hand, if a burning stick or piece of coal is put into nitrogen, it stops burning; if one were to remain in a room filled with pure nitrogen, he would die, although the gas is not poisonous. That it is not poisonous is shown by the fact that four-fifths of the air that we take in with every breath, is nitrogen. Thus we find that while oxygen acts very energetically upon other substances, giving heat, light, or other evidences of action, it is very seldom that nitrogen displays any activity or desire to combine with something else. The quality of nitrogen, as opposed to what might be termed the sociability of oxygen, is



Viaduct at Cleveland, Ohio, Giving the Appearance of Bending Around a Turn, the Illusion Picture by a Panorama Camera

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called inertness. Oxygen reminds one of a very energetic person, who is always ready to enter into whatever is going on, a fight or anything else, while nitrogen is more like a person who is so lazy that it is almost impossible to get him to do anything.

It is very remarkable that, although nitrogen by itself is so very inactive, just as soon as it is joined to some other substances, it forms compounds that are active, and many of these compounds are, by virtue of the nitrogen in them, the most active compounds we know. Thus that powerful explosive, nitroglycerin, is a nitrogen compound. Can an element which is itself so inactive, but can form such active compounds, be made active alone? This is just what has been done by R. J. Strutt, professor of physics in the Imperial College of Science and Technology, London.

Strutt found that if a high-tension electric discharge is passed through the inert gas nitrogen, it changes part of the nitrogen into a very active form. This is not the first time that a gas has been so changed by passing a discharge of electricity through it. Ozone is made by treating oxygen this way.

The active nitrogen discovered by Strutt is very interesting, since it gives off light, showing a beautiful yellowish glow or, when more concentrated, giving a magnificent orange light. When the gas is heated the light goes out, only to reappear again when the gas is cooled, and, what is more remarkable still, the gas glows much more brightly when it is made extremely cold by immersing the glass tube containing it in liquid air. Ordinary phosphorus is white, but if this active nitrogen is passed over it, the color is quickly changed to red and the glow of the nitrogen goes out. The most beautiful colors are obtained when the active nitrogen is passed over iodine, the yellowish glow at once changing to a magnificent light blue flame. Somewhat similar results are obtained with sulphur, in which case a green transparent solid is formed, while arsenic gives a green flame. Many metals are affected by the active nitrogen, and in the case of mercury the compound formed is explosive. While ordinary nitrogen will not conduct a current of electricity, currents pass readily through its active form. If the nitrogen of the air were to be made active, it would be impossible for the electric currents, or for lightning, to be carried by wires, since all of the electricity would leak out.

Why is this nitrogen different from ordinary nitrogen? The answer may be made simple by an illustration. If two prize fighters in the ring had their hands tied together, they would not be very active in a fight with other individuals, but if one prize fighter had his hands free he might prove quite formidable. A molecule of nitrogen is composed of three atoms held together by some attraction, probably electrical, and Strutt considers that his method unties the three atoms and so frees their hands for action.

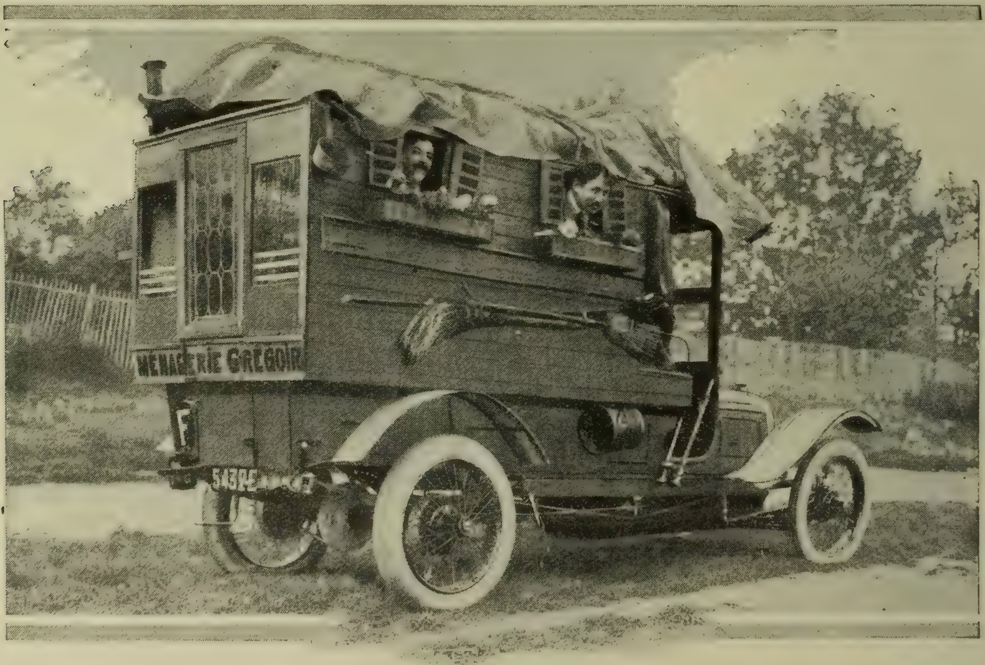
To what uses will active nitrogen be put? It is, as yet, too soon to tell, but it has already developed some uses in purely scientific work. The industrial development of most scientific discoveries, quite naturally, can come only after the lapse of a considerable period of time.

A FRENCH MOTOR CARAVAN

The proprietor of a traveling menagerie in France adapted the body of one of his old horse-drawn caravans to a motor-car chassis, and uses it as a traveling residence. The interior of the quaint caravan is divided into a bedroom and sitting room. The sitting room is at the rear, and in the corner at the rear end of this is a small stove. Flower boxes, mounted under the side windows of the caravan, are an attractive feature.

MINERALS OF BAFFIN LAND

The expedition, led by A. W. Scott, of Toronto, Can., into Baffin Land, in search of gold, returned without finding this precious metal. Nearly the whole time ashore was spent in prospecting along the banks of the Salmon River. The region proved to be of a gneiss and granite formation, which gave no prospect of gold. Extensive deposits of copper were found, however, and immense strata of bituminous coal.



A Quaint Motor Caravan Used as a Traveling Bedroom and Sitting Room by a Frenchman

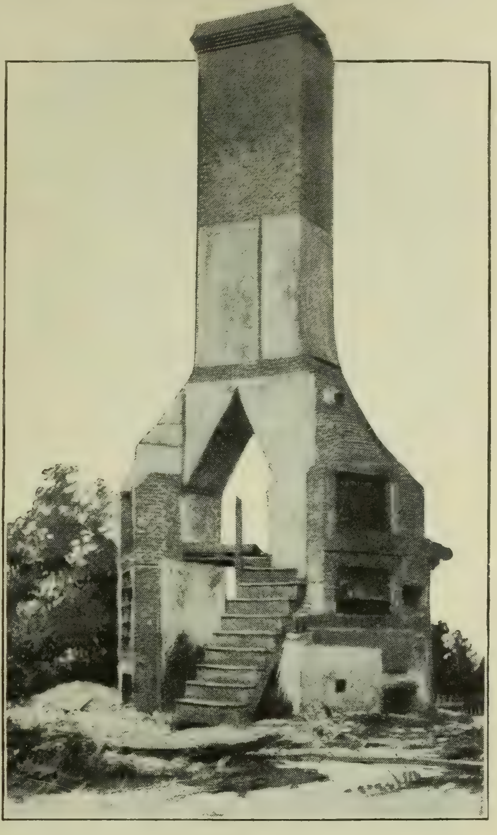
LABORATORIES TO REPLACE THE HEN HOUSE

The good old-fashioned barnyard hen is threatened with a rival in the field of egg production. Dr. Paul Walden, an eminent Russian chemist, is authority for the statement that there will be a new labor-saving process found in the laboratories before long, and this will be nothing less than the accomplishment of the production of eggs without the aid of the hen. Doctor Walden points out that Professor Berthsen of Germany has already accomplished the feat of making a simple compound of the same chemical elements which enter into the composition of an egg, and the process is largely based on the modern methods of capturing and turning to various useful purposes the nitrogen of the atmosphere. It will not be long, Doctor Walden predicts, before the egg will be successfully duplicated in the laboratory and a process worked out that will permit of its manufacture.

TWO-LEGGED GREAT CHIMNEY OF OLD TAVERN

A remarkable chimney was disclosed by the recent tearing down of an old tavern at Kingston, Rhode Island. It shows to unusual advantage the intricate design and execution of a now obsolete type of masonry. The chimney, as shown, is divided in its lower part into two sections, thus providing fireplaces in both wings of the house. The space between the sections is utilized for stairways. A typical New England bean oven may be seen in the right-hand section.

One can readily understand how this great mass of brickwork in the center of the building, when thoroughly heated by its dozen or so fireplaces, would store up an immense quantity of heat and act as a radiator, keeping the house warm throughout the winter nights. Aside from its interest as a specimen of bygone architecture, there are some most exciting tales connected with this structure. In the stormy revolutionary days it was a widely known and famous gathering place, and its reputation not always of the best. A gang of counterfeiters once made their quarters here, and when at last they were forced to flee from the officers of the law, friendly villagers aided them to escape into the west, which at that time meant New York State. During the demolition of the building, a die for making Spanish dollars was found concealed in the timbers, undoubtedly a relic of this episode.



Great Chimney of Old Inn Recently Torn Down in Rhode Island

The timbers of the building were hewn from white-oak logs, and very little decay was evident in them.

ℭA new idea in garages—the garage-hotel—is being carried out in Grand Rapids, Mich. It is a garage, automobile and supply establishment with hotel accommodations as a side issue.

WATER WAGON REDUCES STREET TEMPERATURE

Watering Cart at Deauville, France, Used to Help Combat Midsummer Heat

The French municipalities are very particular with regard to the condition of their roads. This is especially so at the various fashionable resorts and watering places where much depends on the appearance of the place. The city authorities of Deauville-sur-Mer adopted an unusual method of reducing the temperature of their streets during the season just closed. A heavy automobile sprinkling cart was sent through the streets at regular intervals to give them a thorough wetting. This helped to preserve the roads as well as reducing the temperature.

Artificial pumice stone is being manufactured in Europe, the ingredients used being sandstone and clay. It is manufactured in 10 grades, there being a hard and a soft kind designed for the leather, felt, and wood industries; and others for use by sculptors, in finishing lithographic stones, etc.

SUBSTANTIAL LIFE BUOYS MADE AT HOME

Boys Using Homemade Lite Preservers

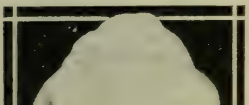
The ring life preservers shown in the accompanying illustration were made right in the summer resort where they were used, by sewing together two pieces of canvas with two circular concentric seams. When the center was cut out and the outer cloth trimmed to the larger circle, the ring that was left served as the cover of the life buoy. This cover was then filled with ground cork such as is used for packing around fancy grapes shipped in barrels, and two heavy coats of paint were applied. These buoys are large enough to keep a heavy man afloat.

PUBLIC PARKING PLACES FOR AUTOMOBILES

Problems of street traffic never dreamed of a generation ago are constantly arising in cities throughout the country because of the general adoption of the automobile as a means of transportation and the congestion that is occasioned by them. It has been found necessary to make regulations regarding the length of stops permitted for machines so that the traffic can be kept moving. The fearful congestion occasioned by long stops of the machines while passengers are shopping, or at the theater, or at luncheon, or attending meetings of one kind or another, has caused traffic commissioners everywhere to seek a relief from the situation in drastic rules that permit stoppages in certain busy sections only long enough to discharge or take up passengers. This has made necessary the establishment of parking places for automobiles adjacent to the points where long stoppages were formerly the most frequent. In several of the larger cities there are now recognized parking spaces to be used solely for machines that are waiting for their passengers or owners. New York and Chicago have had such places for a long time and Boston has recently established them.

THE "LLOYD-GEORGE" STAMP LICKER

The general stamp licking made necessary in England by the Compulsory Insurance Act, which requires the premiums to be paid by special stamps pasted into a book, similar to those used by labor unions, has resulted in a great number of stamp - damping devices being placed on the market. What is expected to be one of the most popular of these, especially among the classes of people who are protesting most vehemently against compulsory insurance, takes the form of a caricature of Lloyd-George, who is responsible for the act.



CHICKEN-FEATHER MUFF

A muff made of chicken feathers is shown in the accompanying illustration. The chicken, however, was not just a simple, domesticated, egg-laying barnyard bird, but a prize "Black Orpington," which died suddenly, cause unknown. The beautiful feathers were too good to waste, so the owner of the fowl skinned the deceased, and had the feathers cured.

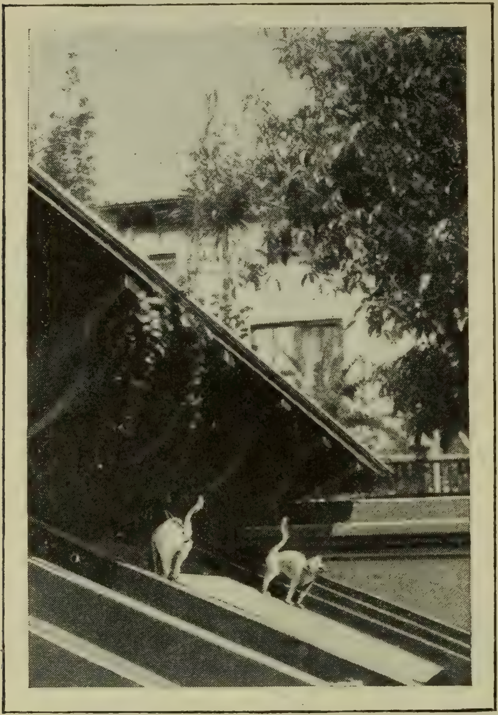
A Muff Made Out of the Feathers of a Prize Chicken

NEW WORD-COUNTING DEVICE FOR TYPEWRITER

A word counter for use on typewriters has been invented by A. W. Frost, of Los Angeles, for his own work. Unlike other counters which have been in use for some time, the new device does not record spaces but counts all words, figures and characters representing words. The counter is actuated by one stroke of a letter bar and one stroke of the space bar. A model which has been used by the inventor during the last year has counted approximately 4,000,000 words. At the recent trial of Clarence Darrow, in Los Angeles, the counter was used and showed a total of 1,969,872 words, written on two machines.

PORCELAIN CATS ON ROOF OF HOTEL

A quaint touch is given to the roof of a California hotel by an occasional cat perched upon its corners. They are not of much service in keeping away mice, but then neither do they sing at night nor keep the guests awake. They are in fact porcelain cats, humorous creations of glazed china, and in their pose they are so characteristic that they provoke a smile from visitors every time. The ones shown in the photograph are engaged in a feline duet, with arched backs, uplifted tails and mouths apparently emitting the familiar wails of battle or courtship. They are imported from France.



On the Roof of a California Hotel have been Placed Porcelain Images of Cats Giving a Concert

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ℭAll motor trucks in England may be compelled by law to carry a mirror, so placed that the drivers can see fast-moving vehicles approaching from the rear.

BOSTON'S PLAN TO RELIEVE TRAFFIC CONGESTION

In common with other large cities of the country, Boston has a traffic problem. The retail shopping center, probably the most crowded point in the "Hub," is now receiving attention from the city's board of street commissioners. After considering various suggestions, which included prohibition of teaming during certain hours in Washington Street, and the making of that thoroughfare an avenue of one-way traffic only, the decision was reached that only by the expansion of the retail district could ultimate relief be obtained. In furtherance of this plan, it is now proposed to widen Chauncy Street at an estimated expense of $1,500,000 and divert thereto the surface cars which now traverse Washington Street between Winter and Boylston Streets. This, the commissioners believe, would have a tendency to extend the retail district, and after the car tracks were removed from Washington Street, the sidewalks along that busy thoroughfare could be widened.

AIR SCOUTS PROVE VALUE IN MANEUVERS

The scout of the air demonstrated his effectiveness at recent military maneuvers held in England and France. Army men of the two nations now generally admit that this new branch of military science will revolutionize the conduct of future campaigns. In England, the mimic warfare was abandoned on account of conditions that were due to the activities of the overhead spies. So adroit were they in unmasking positions that constant changes of tactics were required and broad plans of action were rendered impossible. In a few hours, the airmen accomplished feats which would have required days by cavalry movements. In England, a military conference was ordered to consider the new aspect of things which has been brought about by the advent of the aeroplane.

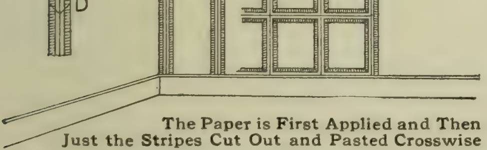
Shop Notes

Staining Wood

A very good method of staining close-grained woods is to use muriatic acid. The acid is put on with a brush like any ordinary stain. The colors thus obtained are artistic and most beautiful, and cannot be duplicated by any known pigment. The more coats applied the darker the color will be. This method of staining has the advantage of requiring no wiping or rubbing.—Contributed by August T. Neyer, One Cloud, Cal.

Paneling with Striped Paper

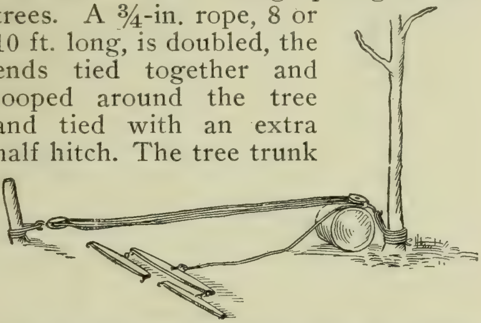
A method of hanging striped paper so as to give a panel effect is shown in the accompanying sketch. The striped paper is first hung in the ordinary manner, as shown at A, and then the stripes are cut out from a piece of the paper, cut on a miter, as at C and D, and pasted across between the vertical stripes to form the panels as shown at B. These can be made up as desired and in divisions suitable to the paper design.—Contributed by Milton W. Eddy, State College, Pa.



The Paper is First Applied and Then Just the Stripes Cut Out and Pasted Crosswise

Pulling Trees

When we transplant trees taken from our nurseries we use the method shown in the sketch for taking up large shade trees. A ¾-in. rope, 8 or 10 ft. long, is doubled, the ends tied together and looped around the tree and tied with an extra half hitch. The tree trunk should be well protected from the chafing of the rope with burlap wrapped around it. The next requisite is a roller. We use a hollow log about 18 in. in diameter over which an ordinary block and tackle is placed as shown.



The Block and Tackle, Pulling over the Roller, Easily Draws the Tree Out with All Its Roots

A good team of horses will easily pull a tree, 3 or 4 in. in diameter, with all its roots.—Contributed by F. E. Dougan, Pawnee, Okla.

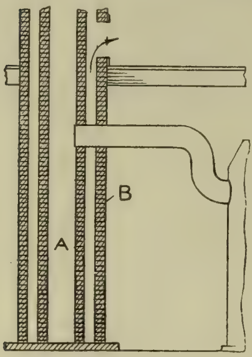
To Remove Grease from Machinery

A good way to remove grease or oil from machinery before painting is to brush slaked lime and water over the surface, leaving the solution on over night. After washing, the iron is dried and then the paint will stick to it readily.

In removing grease from wood, common whitewash may be left on for a few hours and then washed off with warm water, after which the paint will adhere permanently.—Contributed by Loren Ward, Des Moines, Iowa.

Utilizing Heat from a Chimney

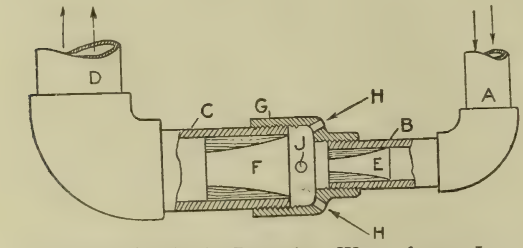
The construction of a furnace chimney that collects the heat of the escaping gases from a furnace and delivers them to an upper room is simple to make and effective in operation. The main flue or smoke chimney A is made of square or round tile built up inside of a brick chimney, B, so that there will be about a 4-in. space between their walls.



At each of the upper floors openings are provided in the outside chimney to allow the heat collected to escape into the rooms. The inner flue is held in place by laying a brick crosswise at intervals as the chimney is being built. The lower part of the outside chimney is provided with an opening to produce an air current. This opening can be connected to receive air from the outside.—Contributed by Geo. Monson, Deposit, N. Y.

A Homemade Ejector

A simple ejector can be made entirely of pipe and pipe fittings in the following manner: The feed pipe A is ½ in. and is connected to an el and nipple, B, the latter being 2 in. long; as the outlet parts must be larger, the nipple C should be 1 in. by 2½ in. long. The discharge pipe D is also 1 in. in diameter. Tight-fitting wood plugs, E and F, are driven into the ends of the nipples B and C. The holes in the plugs are made flaring as shown. The reducing coupling G has seven ¼-in. holes, equally spaced, drilled in its shoulder at such a slant that their center lines if extended would meet at one point inside the pipe. Seven additional ¼-in. holes, J, are drilled with equal spacing through the circumference so that they will be staggered in relation to the holes H.

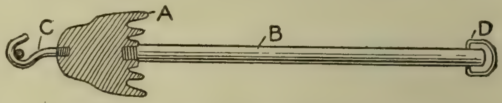


An Ejector for Use in Removing Water from a Low Level with a Low Steam, Air or Water Pressure

In application the ejector is lowered into the liquid, and if, for instance, water is to be pumped out of a basement, a hole should be dug lower than the lowest level and the ejector placed in it, whereupon steam, air or water pressure is applied to the inlet pipe A. Water can be lifted several feet through the outlet D with a pressure of 40 lb.—Contributed by C. R. Engel, Plainfield, N. J.

An Insulated High-Voltage Line Hook

A device that I found very handy in clearing trouble on high-voltage wires in trees is shown in the accompanying sketch. Very often during a rain the wires will burn the limbs of trees. The old way of clearing this trouble is to throw a hand line over the wire and tie it away until dry weather again sets in and it is more convenient to properly insulate the wire. This, however, is a dangerous practice, for the rope is liable to be burnt off if it gets wet, and the wire will then swing back and burn the tree.



An Insulator for Use in Drawing and Temporarily Holding High-Voltage Wires from Trees

My device enables a man to catch the wire with the hooked end and pull it away without any danger of a shock; and a small line fastened in the ring at the other end may be used to tie the tool to any convenient limb. If rain should occur, the insulation will keep the current away from the rope. The handle can be removed and the insulation carried in the pocket and kept dry until needed.

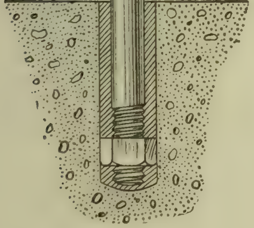
The device consists of a threaded composition insulator, A, such as is used for hanging arc lamps and on street-light brackets. A wooden handle, B, about 18 in. long—a piece of broom handle will do—with a piece of pipe fitted on one end is screwed into the bottom of the insulator. A metal hook, C, is threaded to fit the top of the insulator. The ring D, in the end of the handle, is provided for attaching a rope, when it is desired to leave the device in use for any length of time.—Contributed by A. D. Capell, Hartford, Conn.

Lubricant for Oil-Stove Wicks

When it is necessary to renew an oil-stove wick there is usually trouble in getting the new one to slide in the channel. All that is necessary to overcome this difficulty is to procure some graphite, flake or powdered, preferably the latter, and apply a little on the wick, covering all the surfaces. This will cause the wick to slip easily into place. The same method can be used for any stove or lamp wick.—Contributed by A. H. Harrison, Los Angeles, California.

Concrete-Floor Bolts for Machinery

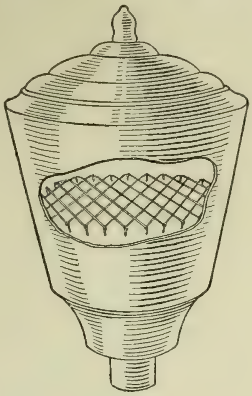
Make a hole in the concrete large enough to receive the nut of the bolt to be used. Place the bolt with the nut down in the hole and fill the space with melted babbitt.



By using this method a temporarily located machine may be taken away, as the bolts are easily removed, and the holes corked, leaving no projections on the floor.—Contributed by G. H. Holter, Jasper, Minn.

Screen in a Coffee Urn

Having purchased a power coffee grinder to use in my business, and experiencing a great deal of trouble with the machine clogging with bits of paper coming from the packages of coffee, I prevented further trouble by placing a screen cut from the bottom of an old letter basket in the hopper. The ends of the wires were bent down to fit the sloping sides of the hopper, and the screen was placed near the top, so that any paper lodging on it could be easily removed.—Contributed by E. C. Ramsey, Columbus, O.

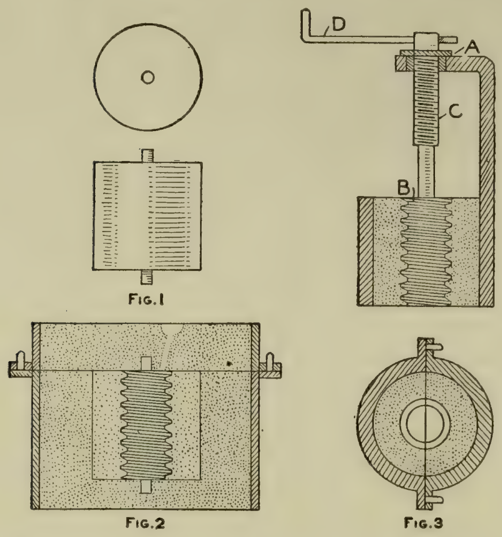


Porch Shades Made of Matting

A serviceable and inexpensive narrow porch shade can be made of linen-warp matting. The matting is cut 12 in. longer than the space in which it is to be used. Take out layers of straw for 6 in. at each end and tie the ends of the warp together. Provide two round sticks, ½ in. in diameter and as long as the matting is wide, usually 3 ft. Tie the remaining ends of the warp around the sticks, placing one at each end of the matting. Roll the matting twice over the stick to be used at the top and hold it in place with cotton tape, 1 in. wide and 9 in. long, using a tape needle for drawing it through the matting. A tape is placed at each edge and one in the center. The ends of the tape are used for fastening the shade to the porch by tying them to nails or screweyes. A tape cut twice the length of the curtain and hung over the center can be tied as required in raising or lowering the shade, or a light rope may be used with awning pulleys instead of the long tape.—Contributed by Gertrude M. Bender, Utica, N. Y.

Making Molds for Worm Gears

Molding and casting worms of a split pattern in the ordinary manner usually results in a certain amount of irregularities, such, for instance, as overlap of the threads at the parting place, which necessitates filing or recutting in a lathe. To avoid this, I have designed the rig shown in the sketch to form a mold perfectly round throughout.



The Screw Pattern is Revolved in the Core Sand, Thus Eliminating Any Irregularities in the Mold

A wood pattern, Fig. 1, is turned up to form a space in the green sand mold to receive the baked core mold as shown in Fig. 2. The split core box, Fig. 3, has an arm extending upward, A. The worm pattern B is made either of steel or brass and is turned and the screw cut in a lathe, allowance being made for shrinkage. The worm, on the end of which is a removable nut, is fitted on a shaft, C, which has a square thread cut on it of the same pitch as the worm. This shaft is used for drawing the pattern worm. The worm mold, as shown in Fig. 3, is made of core sand and dried in a core oven in the ordinary way. Nuts with threads of different pitch for withdrawing other worms can be substituted at A.

To mold the worm, the core sand is rammed in the core box around the worm pattern and the pattern is drawn by turning the crank D. Either right or left-hand screws can be made by using the proper patterns and corresponding shaft and nut threads.

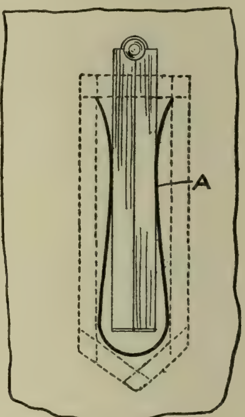
The mold is made up of green sand rammed about the wood pattern to form an opening for the baked core. When the core has been set, the mold is closed, after providing the usual vents, gates and risers.—Contributed by H. Maplethorpe, Silverdale, England.

Annealing Steel in Wood

To anneal steel, heat the piece slowly and when at a low red heat, put it between two pieces of wood—preferably soft wood—and clamp them in a vise. The metal burns its way into the wood, which closes around it and forms an almost airtight charcoal bed. When the steel has cooled and is taken out it will be found thoroughly annealed.—Contributed by G. A. Koerbis, U. S. S. "Vermont."

Rule Holder for the Trousers' Pocket

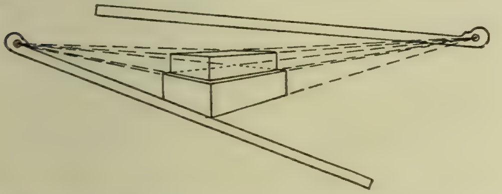
The ordinary bib overalls used by workmen have a pocket for carrying a two-foot carpenter's rule, but when the workman has to climb over scaffolds the pocket often is brought into such a position that the rule will drop out. I prevented this annoyance by bending an old corset steel as shown at A in the sketch and placing it in the pocket. The shape of the steel clamps the rule and holds it in the pocket, even though the trousers be held upside down.—Contributed by Homer Puyear, Owensboro, Ky.



A Board for Making Perspective Drawings

Perspective drawings are seldom made in drafting rooms because of the inability of most draftsmen to draw freehand, and the lack of mechanical means for the purpose. Such drawings are often very helpful, however, for workmen are not always able to grasp the meaning of plans, elevations or sections, but, once shown a rough perspective, they readily understand the whole idea. The device shown in the sketch, which is described by a correspondent of the National Builder, will be found useful in drawing simple objects in perspective.

In the first place, the board should be considerably wider than the required drawing, so that the vanishing points may be located far enough away to obtain a good perspective. The straightedges are made by gluing a little piece on the straight side at one end so that the hole can be made in line with the edge to be used. Brads are driven into the board at the vanishing points and a straightedge placed over each one as shown. Using a vertical line to begin with, the four sides of the plan can be laid off without taking the straightedges off the pins. When using the T-square or triangle, the straightedges may be pushed up out of the way.



One End of Each Straightedge is Pivoted on the Drawing Board, Locating the Vanishing Points

A Transom Refrigerator for Winter Use

A very serviceable refrigerator, the temperature of which can be easily regulated, may be had by fitting the transom space, Fig. 1, over the kitchen door with a glazed frame on the outside as shown in Fig. 2. If the transom opens downward, change the hinges so that it will swing from the top. A few holes should be bored in the outside frame which can be covered at will to admit or shut off a supply of cold air. By leaving the transom closed or partly open the supply of warm air from the inside may also be regulated.—Contributed by Jas. T. Gaffney, Chicago.

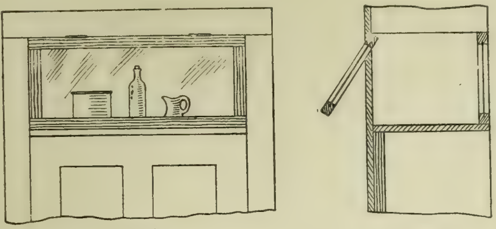
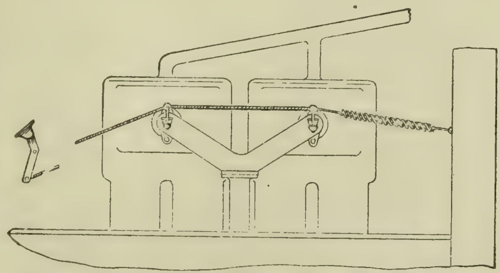


Fig. 1 Fig. 2

A Window Sash Placed in the Outside Part of the Transom to Form a Cold Space in Winter

An Accelerator for a Gasoline Engine

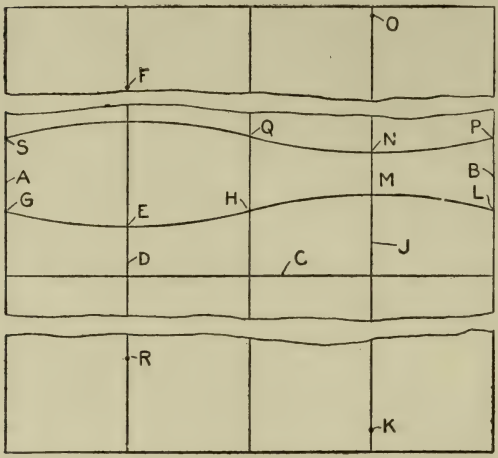
Many of the older-type automobiles were not equipped with accelerators, a device which is of considerable advantage in hastening the speed of a motor. Any such automobile may be easily equipped with an attachment that will serve the same purpose as well as those built on modern motors, by placing two small petcocks in the inlet manifold. Holes are drilled and tapped to receive the petcocks, and an extension is attached to their handles to give a leverage for the wire pull. They are connected with a foot-lever arrangement, as shown in the sketch. —Contributed by O. H. Meyer, Churdon, Ia.



Petcocks are Attached to the Intake Manifold and Operated with a Foot Lever and Wire

Rule for Laying Out a Six-Piece Elbow

Draw two outside lines, A and B, their distance apart being the full circumference of the elbow. Divide the space between them into four equal parts by parallel lines as shown. Draw a line, C, at right angles to A and B and mark on the line D, from C up, the width of the piece wanted, thus locating the point E. It makes no difference in the procedure whatever this width may be. Then set the compass points straight across on lines A and B; and, with one point at E and the other on line D, wherever it will come, say at F, scribe the arc GH. Next, set one point at H and the other wherever it will fall on line J, or at K, and scribe the arc HL.



The Pattern as It is Drawn to Form the Parts for a Six-Piece Elbow

Thereupon, mark any width wanted, also from line C up, at M, 1, 2 or 3 in., as the case may be, and set one point of the compass at N and the other where it will come on line J, or at O, and scribe the arc PQ; then, set one point of the compass on Q and the other where it will come on the line D, or at R, and scribe the arc QS. There is no difference in the elbow pattern as to width of each part.—Contributed by S. C. Shipman, St. Petersburg, Florida.

ℭA weak solution of hydrochloride of lime will clean moldy walls.

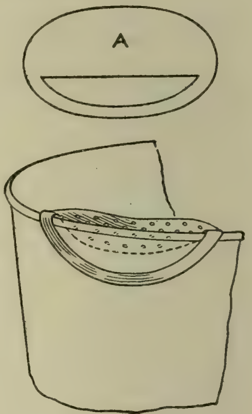
How to Cool Hot Bearings

Newly babbitted bearings are sometimes inclined to run hot. In a case of this kind, after scraping the box well to make the shaft fit closely in the box, use some good light oil mixed with common sulphur. Sulphur contains just enough grit to grind the babbitt smooth, but will not injure the shaft. Other material having a grit should not be used as it is liable to grind a shoulder on the shaft.

Should the bearing run hot after using the sulphur and oil, then use white lead and water—a very cooling mixture. Keep the shaft running and pour white lead and water into the bearing until it finally cools. Never shut down the machine while the bearing is hot, as the babbitt will contract and stick the shaft.—Contributed by Harry Fritzinger, Decatur, Ind.

Soap Tray for a Bucket

Any tinsmith who can cut the pattern for a lip on a gallon measure can also cut a tray that can be used in connection with both wood and galvanized-iron buckets for holding the soap above the waterline when the bucket is used for scrubbing, window washing or similar work where soap is to be used, instead of letting the soap remain in the water to dissolve, says Metal Worker. All that is necessary to do is to cut a wire long enough to fit around one edge of the pattern A, after it is formed in the shape of a pocket in the bucket. Then the wire is bent down and hung over the edge, as shown in the sketch. If desired, the pocket or tray can be perforated to let the water run away more freely.



To Charge a Battery from a Direct-Current Circuit

In order to know how to connect and charge a storage battery it is quite necessary to understand the relation between the electrical quantities associated with any ordinary electric circuit carrying a direct current. The flow of electricity in a circuit is called the current and is measured in a unit called the ampere; the electric force producing the current is called the voltage, potential or electromotive force, and is measured in a unit called the volt; while the opposition offered by the circuit to the passage of the electricity through it is called the resistance and is measured in a unit called the ohm. These three quantities, namely, electromotive force, current and resistance, bear a definite relation to each other and this relation is expressed by the following simple equation, which is called Ohm's law:

$$\text{Current} = \frac{\text{Electromotive force}}{\text{Resistance}}, \text{ or,}$$

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

As an example, if a battery having a voltage of 1.5 volts is connected to a coil of wire having a resistance of 3 ohms, as shown in Fig. 1, a current of .5 ampere will be produced in the circuit. If the voltage be increased, the resistance remaining constant, there will be a proportional increase in the current, or if the resistance be decreased, the voltage remaining constant, there will be a proportional increase in the current, etc. In other words, the current in the circuit may be varied by changing either the voltage acting on the circuit or the resistance of the circuit. The voltage can be increased by connecting more cells in the circuit in such a way that their voltage acts in the same direction as the voltage of the cells already in circuit, as in Fig. 2. The total voltage acting on the circuit will then be equal to the sum of the voltages of the different cells, and the current will pass through each of the cells in the same direction as its electromotive force acts, or all of the cells will be supplying energy to the circuit. If, however, some of the cells be connected in the circuit in such a way that their voltage acts in an opposite direction to the direction in which the current is passing through them, as shown in Fig. 3, they will tend to decrease the current, or energy must be supplied to them from the other cells. The voltage producing the current in the circuit in the latter case is not equal to the sum of the voltages of the different cells, but it is equal to the difference between the sum of the voltages acting in one direction and the sum of the voltages acting in the opposite direction. This difference is called the effective voltage, and the current in the circuit will be equal to the effective voltage divided by the resistance of the circuit. The direction of the current will of course correspond to that of the effective voltage.

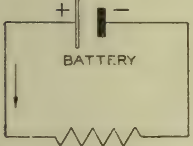


FIG. 1

Resistance Coil Connected to a Single Cell

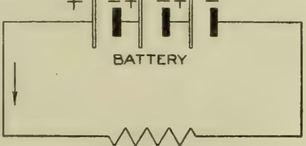


FIG. 2

Voltage of All the Cells Acts in the Same Direction

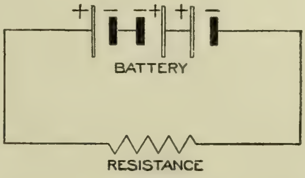
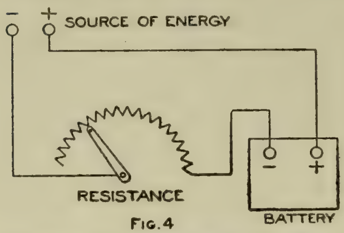


FIG. 3

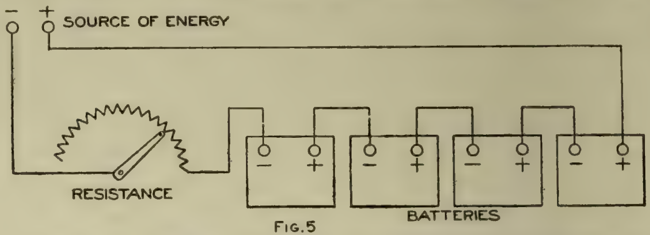
Voltage of All Cells does Not Act in the Same Direction

Those cells whose voltage acts in a direction opposite to the direction in which the current passes through them, when they are connected in circuit, are being charged, as energy is being supplied to them from the other cells, which are discharging.

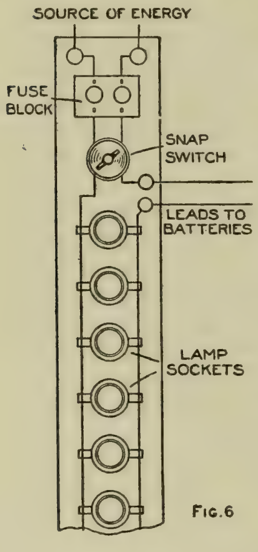
A primary battery is one in which the electrical energy it is capable of supplying is due to a chemical reaction in the cell that takes place when the cell is supplying current. A storage cell, secondary cell, or accumulator, as it is variously called, is a cell in which a chemical action is first produced by an electrical current through the cell from some external source of energy, after which the cell is capable of delivering a current to an external circuit by means of a secondary or reversed chemical action. The process of storing the electrical energy by sending a current through the cell from some external source of energy is called charging. When the cell is producing a current in an external circuit, or it is supplying energy, it is said to be discharging.



Connections for Charging a Single Storage Battery



A Number of Storage Batteries are Placed in the Circuit with a Resistance on the Main Lines of Electrical Energy



A slight chemical action takes place when a current is sent through a primary cell in a direction opposite to its voltage, but the action is by no means as great as that occurring in the storage cell. The following discussion will be confined to the charging of storage batteries; the charging of primary cells, by sending a current through them, not being practical.

As an example, suppose a 110-volt direct-current circuit is available and it is desired to charge a small 6-volt storage battery, such as those that are so extensively used on automobiles and launches for ignition and lighting. All storage cells have what is called a normal charging current and this current must be passed through the cells for a certain number of hours in order to fully charge them. Thus a 60-ampere-hour battery is one which is capable of supplying a current of six amperes for 10 hours, and more than this must be put into the battery when it is being charged, because no battery has a 100-per-cent efficiency. Assume that the charging current of the battery is 6 amperes, and its voltage 6. If the voltage of the source of energy is 110, the resistance that must be placed in series with the battery can be determined by means of the following equation, in which V is the voltage of the source of energy; E, the voltage of the battery being charged; R, the resistance of the circuit, and I, the current in the circuit.

$$I = \frac{V-E}{R}$$

Substituting in the above equation we have,

$$6 = \frac{110-6}{R}, \text{ or } R = \frac{110-6}{6} = 17\tfrac{1}{3} \text{ ohms.}$$

The above resistance of $17\frac{1}{3}$ ohms represents the total resistance of the circuit, and includes the resistance inside of the battery, the resistance of the leads, and the resistance of the current-regulating device connected in circuit, which is called a rheostat. When speaking of the voltage of a battery as being so many volts, reference is made to the difference in electrical pressure between its terminals, which is different from the electrical pressure existing inside the cell. There is a certain resistance in ohms offered by the cell itself to the passage of a current through it, and as a result, only a part of the electrical pressure existing inside the cell is available at the terminals when the cell is discharging, because some of the pressure is required to cause the current to pass through its internal resistance. If a storage cell is being charged, a voltage must be impressed upon the cell that is greater than the voltage inside the cell in order that some voltage be available to send the current through the internal resistance. The voltage between the terminals of the cell is the same as the voltage inside only when there is no current through the cell.

As the process of charging a battery continues, the voltage inside the cell increases, and as a result, there will be a decrease in the current, because the effective voltage acting on the circuit has been decreased, and the resistance must be decreased if it is desired to maintain the current constant.

In charging a single 6-volt battery from a 110-volt circuit, as shown in Fig. 4, the greater part of the energy supplied by the source of energy is expended in the resistance, and the process is not at all efficient. The ratio of the input to the battery and the input to the resistance is the same as the ratio between the voltage over the battery and the resistance respectively. This charging process can be made a great deal more efficient by connecting a number of storage batteries in series, as shown in Fig. 5, and charging them all at the same time. The total voltage over the batteries in this case will be much greater than in Fig. 4, and a much smaller resistance will be required. It is thus seen that the value of the resistance in ohms that is to be connected in series will depend entirely upon the effective voltage and current required.

If it is desired to charge a single 6-volt battery as was originally assumed, a very simple and inexpensive resistance may be made as follows: Obtain 10 porcelain lamp sockets, seven 32-cp. lamps, two 16-cp. lamps and one 8-cp. lamp. Mount the sockets on a piece of board covered with asbestos, just far enough apart so that the 32-cp. lamps will not touch when placed in the sockets. On one end of the board mount a 10-ampere snap switch, a plug fuse block and four binding posts, and make the connections as indicated in Fig. 6, using insulated wire. The charging current supplied to the battery may be regulated by screwing the lamps in or out of their respective sockets. If a larger current is desired, more lamps may be connected in parallel with those already in use. The completed board may be mounted on the wall and a small shelf provided for the battery, which will give a very convenient means of charging it.

When a very low resistance is desired, some form of wire resistance should be used, as the number of lamps required in parallel to give such a resistance would be excessive. The design of such a rheostat would of course depend upon the requirements, and a general description cannot be given.

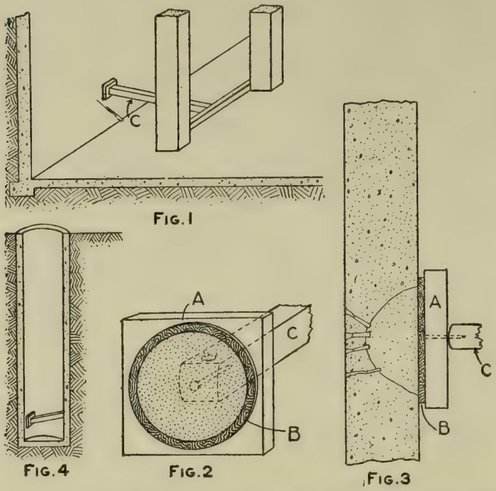
A Putty Grinder

Having a large number of windows to putty each week, I found it quite a task to prepare the putty. I facilitated the work by using an ordinary meat cutter or sausage grinder. The grinder will soften set putty and will quickly prepare cold putty. It will not, however, grind old putty or make putty from whiting and oil.—Contributed by H. G. Stevens, Dunham, Que.

¶Roman gold metal is made by melting equal parts of silver, brass and copper.

How to Stop Leaks in Concrete

The method of stopping leaks in concrete, described by a correspondent of the Engineering Record, consists in plastering the wet, leaking surface of the concrete with waterproofed mortar. The mortar is kept from being washed away by suitable bracing against a properly constructed gasket.



The Manner of Placing the Mortar and Holding It in the Cavity While the Cement Sets

Assuming that a leak is to be repaired in a basement wall, Fig. 1, 1 ft. or more above the floor, the loose material should be scraped or dug away, leaving a saucer-shaped cavity as large in diameter as necessary. If the holes through which the water is leaking are large enough, they can be stopped with plugs covered with patches of burlap driven in tightly.

The form is then prepared. In case the diameter of the saucer-shaped hole is 6 in., a board, A, Fig. 2, 2 in. thick and 8 in. square, will be required. A 1/4-in. twisted-burlap rope, B, is tacked on the board and the latter nailed to a brace C.

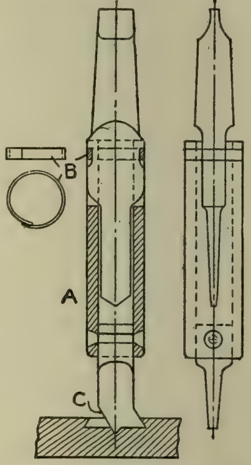
Enough 1-to-2 mortar, waterproofed, is prepared, to which has been added, just before leaving the mixing box, bichromate of soda to the amount of 1 or 2 per cent of the cement. This is added to make the mortar quick-setting. The mortar is placed on the board in a cone-shaped mass and then thrust quickly and firmly with a twisting motion into the cavity. The brace is driven into place at the same time. The process is illustrated in Fig. 3. The twisting motion aids in forcing the mortar into the smallest crevices and drives away such parts of the mortar as may have been squeezed out between the concrete and the gasket.

A very simple application of the method is shown in Fig. 4. A more difficult application, but not impracticable, is one where it is desired to plaster large areas. A little experience and patience makes the matter easy.

A good waterproofing mixture is made as follows: Concentrated lye, 1/3 lb.; powdered alum, 3/4 lb., which should be mixed in 1 gal. of water at least one hour before using. All of this mixture is used to one sack of cement, and is poured in at the same time as the water used to temper the mortar.

Drilling and Undercutting Holes

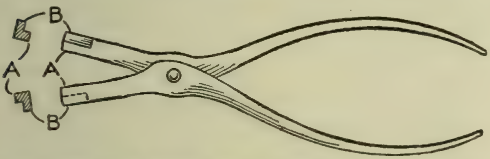
A tool for drilling and undercutting holes for retaining babbitt metal in bearings or other wearing surfaces is shown in the accompanying sketch. The drill is an ordinary flat drill with a widened portion below the taper shank. When the hole is drilled, the undercutting tool, which consists of a piece of steel tube, A, with the cutter fastened inside of the end, is slipped over the drill and held in place with the spring B. The heel C on the point is slightly rounded so that it will force the toe into the metal. There is enough clearance between the drill and the tube to allow the necessary amount of wabble.—Contributed by J. H. Maysilles, Rochelle, Ill.



Pliers for Removing Piston Rings

The pliers shown in the sketch are a much more satisfactory and quicker tool for removing piston rings than strips of metal or broken hacksaw blades. The tool works in a manner, the reverse of the ordinary pliers, that is, the jaws open when the handles are squeezed. To take off a ring with this tool, it is only necessary to insert the points A in the piston ring where it is cut and the projections BB will then engage the ring on both top and bottom.

The ring can then be opened far enough to allow it to be slipped off the piston. The danger of breaking rings is reduced to a minimum, and in most cases a whole set can be taken off or put on in the time that would otherwise be consumed in looking about for strips of metal or broken hacksaw blades to use under the rings.



The Pliers will Easily Spread the Ring Enough to Remove It from the Piston

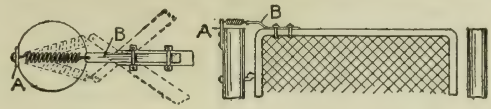
Repairing a Split Lead Pipe with Cement

The lead pipe forming the trap under a sink broke or split from pressure of freezing water. As the break, which was 1½ in. long, was in a place difficult to reach, it could not be stopped by soldering. I repaired the break with Portland cement in the following manner: About a half teacupful of dry cement was applied to the break by placing the cement in a cloth and tying the cloth around the pipe. The leaking water dampened the cement, which set over the opening and closed the break. This made a permanent repair.

After the cement had set the cloth was removed and the hardened cement rounded up and painted.—Contributed by R. F. Hall, N. Tonawanda, N. Y.

A Gate-Closing Spring

A self-closing gate attachment that will draw a gate from either side can be easily and quickly constructed by using a strong coil spring and two pieces of stake iron. One of the pieces of iron, A, is fastened with two lag screws to the top of the post on which the gate is hinged; the other piece B is bolted to the top of the gate. The spring is attached between the pieces of iron as shown. It makes no difference which way the gate is opened, the spring will pull it closed.

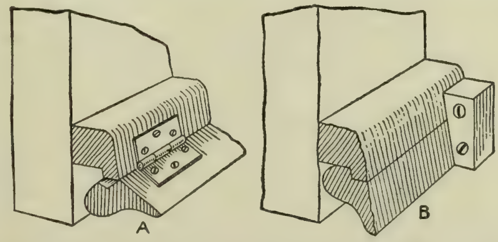


The Spring is So Attached That It will Draw the Gate Closed from Either Direction

Threshold Storm Strip on a Door

An effective method of keeping rain from beating in under a door is to equip the bottom edge of the door with a closing strip, as shown in the sketch. The strip will also prevent dust from entering.

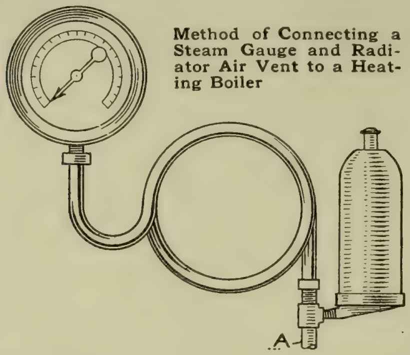
Two pieces of wood, as long as the door is wide and shaped as shown at A, are hinged together, and the upper strip is fastened with screws to the door. The lower strip swings outward when the door is opened, because its upper part is the heavier. When, on the other hand, the door is closed, the lower strip strikes a block, as shown at B, which is fastened to the door casing and causes the strip to close tightly over the outside of the threshold strip.—Contributed by J. Naylor, Schenectady, N. Y.



The Swinging Strip Closes Tightly over the Threshold Strip as the Door Closes

Convenient Location of a Steam-Heating-Boiler Gauge

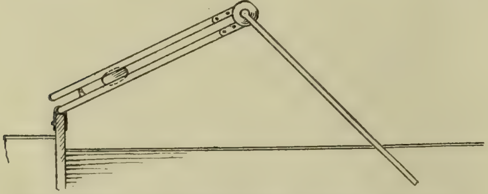
The manner of connecting an automatic vent, the kind used on a radiator, with a steam gauge on the first floor of a house, so that it is not necessary to go to the basement to see if the pressure is at the right point, is shown in the accompanying sketch. As quite a length of pipe is required at A to carry the steam from the boiler, a radiator vent must be used to remove the air from the pipe. While the sketch shows a coil in the pipe, this is not necessary; in fact, it is in most cases much better not to have a coil.



Method of Connecting a Steam Gauge and Radiator Air Vent to a Heating Boiler

Preventing Automobile Windshields from Rattling

When a folding-type windshield of an automobile has become so worn that it rattles when driving, this annoyance may be easily overcome by placing an ordinary hollow rubber ball between the parts as shown. A ball of the "come-back" kind can be purchased at any toy store. The ball not only prevents the rattle but will greatly assist in stopping further wear on the loose parts.—Contributed by Urban A. Towle, Portland, Maine.



The Weight of the Upper Glass Keeps the Ball in Place between the Panes

Removing a Button from a Child's Nostril

A three-year-old child snuffed a button up its nostril and the mother, in an attempt to remove it, had caused the button to be pushed farther up the channel. Doctors probed for the button without success. The distracted mother happened to think of snuff, and, as there was some at hand, took a pinch of snuff between the thumb and forefinger and held it close to the child's nose. The violent sneezing caused the button to drop out. Such an accident may come under the observation of any parent, and if so, this method can be used to relieve the child when medical assistance is not at hand.—Contributed by Katharine D. Morse, Syracuse, N. Y.

How to Mount Maps on Canvas

Large maps and plans that are to be used on rollers in an office, or are needed for constant reference on the outside, should be mounted on canvas and varnished to preserve their appearance. The professional map mounter charges a comparatively high price for this work and I have been very successful in mounting maps at home by the following method:

A large board, table or drawing board a few inches larger each way than the print to be mounted is the first requirement. A piece of canvas about 3 in. larger each way than the print is stretched over the board. The canvas should be stretched so as to remove all wrinkles, and the edges fastened with thumb tacks or large-headed carpet tacks. A large piece of white oilcloth, or white paper, is then placed on a table, care being taken that there are no wrinkles, folds or creases in it. The map is then laid out on the prepared surface, face downward, and the back sponged until all stiffness disappears, whereupon it is given a good coat of paste. Any paste can be used, but the following recipe will insure good work:

Mix into a dough one cup of flour

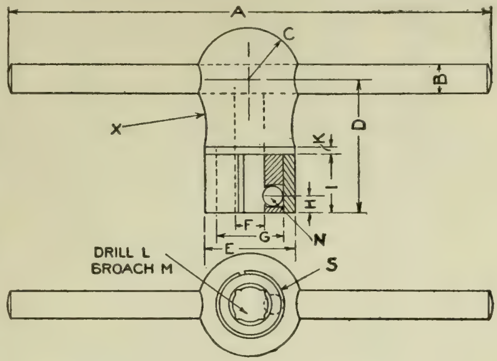
and one cup of water, to which is added a little salt. While mixing and beating, pour into it one quart of boiling water in which a lump of alum, the size of a hickory nut, has been dissolved. When the paste has the consistency of thick cream, set it over a fire in a double boiler and stir for 10 minutes while the water in the outer vessel is kept boiling. Allow it to cook the full time, then remove it from the fire and strain through a cheesecloth. Add a teaspoonful of oil of cloves, stirred well into the paste, and pour into jars to cool. Pour melted paraffin over the surface of the paste and cover tightly.

After a smooth coat of paste, free from lumps, has been applied to the back of the print, it is placed on the canvas, or, if the print is too large, the board on which the canvas is stretched may be placed on the print. A thick sheet of paper is laid on the face of the map and a rubber hand roller is used to roll it flat. If air bubbles appear, they should be pricked with a fine needle and pressed down by means of a clean cloth.

The map is allowed to dry thoroughly on the board and then given a good coat of strong size, to prevent any discoloration from the varnish. Care should be exercised in applying the size, as any portion left uncovered will show brown when the varnish is applied. After the size is thoroughly dry, a thin coat of the best paper varnish should be applied with a flat hog's-hair brush. About 1/4 in. of the canvas on the edge is turned over and pasted to the surface.—Contributed by Geo. M. Petersen, Buffalo, N. Y.

Tap Wrenches

A design of tap wrench which will hold taps so that they cannot drop out when removed from the work is shown in the accompanying sketch;



Design for a Tap Wrench to be Made in Any Size Shown by the Reference Letters in the Table

and the table gives the sizes for a set of wrenches taking taps from 3/16 to 5/8 in., inclusively.

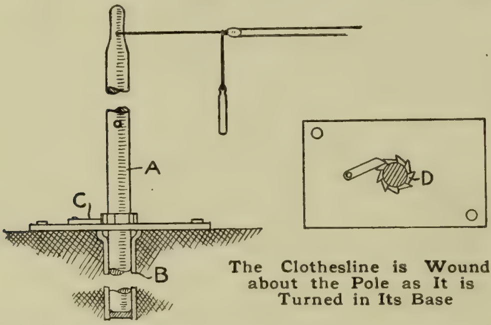
The construction of this wrench is as follows: The body is turned, drilled and reamed for the handle, the hole is also drilled and later broached out, to take the square part of the tap shank. After broaching, a small hole is drilled for the locking ball N. This hole should not be drilled entirely through, and enough stock should be left at the inner edge to keep the ball from passing through and dropping into the broached hole. The inside face of the ball strikes the flat on the shank of the taps and the ball is held against that part by the pressure of the spring S against its outside face.

SIZE	A	B	C	D	E	F	G	H	I	K	L DRILL	M SQ	N BALL	X
3/16	5	1/4	11/32	15/16	1/2	.190	.420	1/8	3/8	1/16	5/32	.143	1/8	....
1/4	7	5/16	13/32	15/16	9/16	.260	.484	1/8	3/8	1/32	13/64	.194	1/8	....
5/16	8	5/16	13/32	15/16	5/8	.295	.540	1/8	3/8	1/32	15/64	.220	1/8	....
3/8	9	3/8	13/32	15/16	21/32	.320	.585	1/8	3/8	1/32	17/64	.240	5/32	....
7/16	9 3/4	7/16	9/16	1 3/16	23/32	.345	.633	5/32	7/16	1/16	9/32	.258	5/32	....
1/2	10 1/2	1/2	9/16	1 3/16	3/4	.375	.660	5/32	7/16	1/16	5/16	.278	5/32	....
9/16	12	9/16	9/16	1 1/4	25/32	.435	.720	5/32	7/16	1/16	11/32	.325	5/32	....
5/8	15	5/8	9/16	1 3/8	27/32	.485	.770	5/32	7/16	1/16	25/64	.360	5/32	9/16

Each Size of Tap is Driven by a Wrench Whose Dimensions are Given by the Reference Letters at the Heads of the Columns, Which Correspond to Those in the Sketch

With the use of this wrench, all three taps of a set can be run through, one after another, and the operation of changing the taps simply consists in pulling the wrench off the tap shank and pushing the square of the second tap up into place, where it is held by the action of the spring against the ball.—Contributed by Chas. F. Scribner, Hartford, Conn.

A Revolving Clothesline Pole



The Clothesline is Wound about the Pole as It is Turned in Its Base

The construction of the pole shown in the sketch saves the trouble of tying and untying knots to tighten and loosen a clothesline. If used on a pulley line a rod and weight must be placed on the pulley to keep it from turning. The pole A is round and the lower end is set in a piece of cast-iron water pipe, B. The pole should turn easily in the pipe. A block is placed in the lower end of the pipe to prevent the pole from boring into the earth. A hole is drilled through the pole for a lever with which to turn it, and a pawl, C, placed on a board at the base, engages in ratchets made of small wood strips attached around the pole. The board is staked to the ground. An old broom handle can be used as a lever.—Contributed by O. K. James, Corte Madera, Cal.

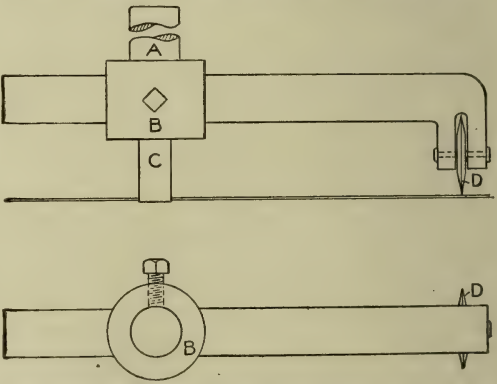
Changing a Hot-Water Heater from Coal to Gas Burning

An economical change can be made from the dirty, hand-fed hot-water heater that burns hard coal, to a gas-burning heater. Line the fire box with a layer of common brick, using half bricks and arranging them carefully to make a good lining, without binding the bricks together. A piece of cast iron is placed over the top of the new lining, allowing only enough space open to give a good draft. A gas connection for a common burner, such as used on a gas stove, is made through the small clinker door in front of the heater. If the burner used is one with a small tap light, it will only be necessary to turn on the large burner for a few minutes to have warm water, then turning it off and using the small tap light to keep it from cooling.

The advantage of this change is that a tankful of water can be heated within a short time, which is ordinarily sufficient for a day's use. All the dirt and dust that go with a coal heater are eliminated; the fuel expense is less than with coal, and the outfit will work as well as an expensive gas heater. —Contributed by David Harrison, Evanston, Ill.

Cutting Disks from Sheet Metal

A very handy device, for use in a drill press to bore holes in or cut disks of sheet metal, is made as follows: The shank A is turned to be held in a drill-press chuck and has a body, B, and a center extension, C. A square hole is cut horizontally through the body B to receive a ¾-in. square bar. The end of this bar is turned at right angles and a slot cut in it to receive a small cutter wheel, D. The body B is provided with a setscrew so that the cutter may be adjusted to cut disks or holes of any size.

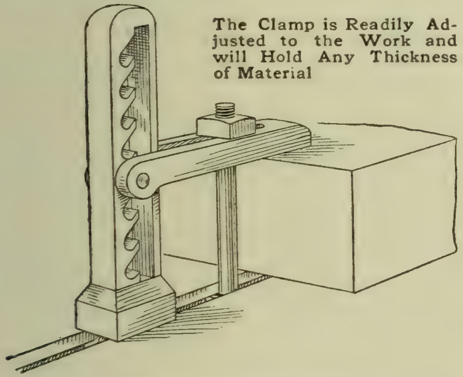


The Metal is Pierced by the Revolving Cutter in the Same Manner as a Pipe

The sheet to be cut is placed on a flat board on the faceplate of the drill press and a hole first drilled in the metal at the center to receive the extension C. The cutter bar is then set for the right diameter and the drill started. Pressure is applied in the same manner as in drilling.

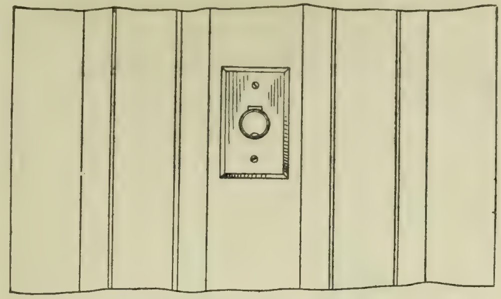
Clamp for a Faceplate or Planer Bed

A good deal of time is lost in a shop where the workmen must look for clamps and blocks for holding a piece of work on a faceplate or planer bed. This loss of time can be prevented by using clamps made as shown in the sketch. The time it takes to make these clamps will be repaid many times over in their continued use. All that is required is one set of clamps for each machine as they can be adjusted to hold any thickness of material being machined. The construction of the clamp is easily understood from the sketch. All parts are connected so that none can be lost.—Contributed by R. T. Taylor, N. Emporia, N. C.


The Clamp is Readily Adjusted to the Work and will Hold Any Thickness of Material

A Wicket for a Door

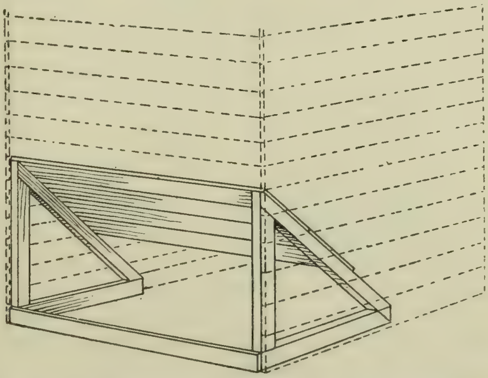
Instead of cutting a hole in a finely finished door and placing an unsightly wood disk on a screw to cover a wicket, we used two brushed-brass, flush switch plates purchased at an electrical store. In the center of such a plate is a hinged brass cover which, when closed, fits perfectly smooth. A 2-in. auger hole was bored through the fine walnut door, and the plates were screwed on over the hole on each side of the door. A small groove was cut on the loose cover so that it can be easily opened with the finger nail. These plates can be had in any finish to match the other hardware and lighting fixtures of a building.—Contributed by Martin Smith, Mt. Vernon, Indiana.


A Brushed-Brass Plate Covering a Wicket in a Finely Finished Lodge-Room Entrance Door

Holding Coal Back from a Bin Opening

A simple device I use to prevent coal from running out of a bin onto the floor and at the same time providing a suitable place at the bottom for shoveling the coal in the usual manner, is shown in the illustration.

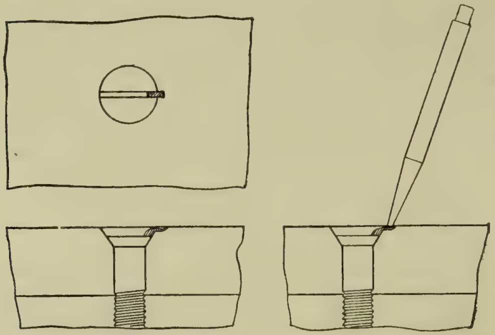
Another advantage of this device is that the opening to the bin may be entirely closed with a door and the bin thus altogether cut off from the basement so that the coal dust will not fly


The Boards Prevent the Coal from Running Out of the Bin Opening and Provide a Place for Shoveling

about. It also allows the door to be opened and the coal shoveled out without preventing the closing of the door afterward.

Locking Screws in Metal

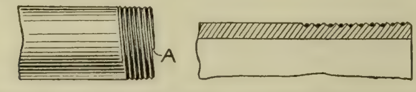
A flat-head or fillister-head screw can be easily locked in metal by driving a portion of the material into the slot of the screw. After turning the screw home tightly, the metal is driven in with a small flat chisel or drift, as shown in the illustration.—Contributed by F. G. Marbach, Cleveland, O.



A Portion of the Metal is Driven into the Screw Slot, Which Locks the Screw

Making a Tight Joint on Worn Pipe Threads

A method that proved satisfactory for making a tight joint in the couplings of a pipe is shown in the sketch. The pipe connected in this manner was a 4-in. steam lead to a large pump from the header of two boilers. The pipe was disconnected in order to make some repairs to the boiler. When put together again there were some very bad leaks in the couplings, and it seemed for a time impossible to get them tight.



A Piece of Copper Wire Wound in the Threads on the Pipe Closed the Joint Tightly

The beginning of the first or starting thread on the pipe was filed away until the full thread showed at A, at which point a piece of No. 20 gauge copper wire was hooked over the edge of the pipe and wound around it in the bottom of the V of the thread. The coupling was then screwed over it, which flattened the copper wire, wedging it tightly between the threads, and thus making a tight joint. The joints were in use without trouble for over a year, when a new line was installed. —Contributed by F. W. Bently, Huron, South Dakota.

A Needle Threader

A small wire violin or mandolin string and a thin piece of sheet brass constitute the parts of this needle threader. One end of the wire is bent into a hook, Fig. 1, which should be small enough to enter the eye of a needle; the brass is cut to the shape shown in Fig. 2 and bent on the dotted line to make it double over the wire. The wire is placed in the bottom of the bend. The pointed ends of the brass should be bent outward or separated slightly so that the needle will enter between them.—Contributed by W. C. Loy, Rochester, Ind.

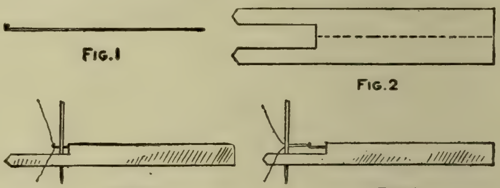


Fig.1

Fig.2

Fig.3

Fig.4

The Small Hooked Point for Drawing the Thread Through is Easily Inserted in the Needle Eye

Water Not a Good Ground for Telephone Wires

While water is very often used as a ground, and many electrical workers have never doubted it, there are many cases in which it does not constitute an effective ground. Mr. S. Price, plant chief of the Canadian Bell Telephone Company, in a letter to the Telephone Gazette, recites the following instances in support of this:

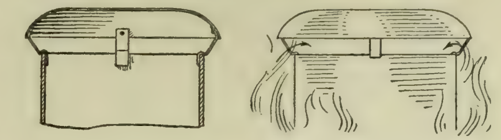
Trouble was reported upon a certain single line and, upon test, it was found that at times it would work fairly well, and at other times it appeared to be heavily grounded. We found the line untied from a side block, and lying in a stream, but not touching the bottom. There was a stone quarry further up the stream, and when the wheels were running the water in the brook became dirty, and the line would not work, but when the wheels stopped the water became clear, and it was possible to ring and talk through the water. When the water was clear it evidently was a poor conductor and the talking and ringing currents on the telephone line could not pass to ground between the telephone stations to any great extent, and as a result the system worked fairly well.

On another occasion a lady reported that in the afternoon about 5 o'clock she could not get central, but about six she could; and that at some other times she could, but at other times she could not. It took me quite a while to find that trouble, because sometimes at 5 p. m. she could get central.

The instrument was grounded on an iron pump pipe. The pipe did not touch bottom. The lady would go out in the afternoon visiting, and when she got home would go straight to the telephone to call up, but as the well had had all the afternoon to settle, and the water was clear, she could not get central. After pumping water, and getting supper, the water was stirred up a little, and she could get central. In this case it was necessary to have a good ground at each subscriber's instrument, the ground or earth forming one side of the circuit, in order that the line might operate.

Cover for Casehardening Pot

Ordinarily a pot containing potash is placed on the fire without any cover and it requires considerable time to melt the crystals, owing to the fact that most of the heat from the fire escapes around the outside of the pot. A cover with the edges turned down all around and mounted on three legs which will fit on the edge of the pot, provides a way for the heat to enter the pot at the top. The legs can be long enough to hold the cover about ½ in. above the top of the pot. The curved cover will retain and reflect much of the rising heat so that the potash will be heated from the top as well as from the bottom.—Contributed by Chas. Homewood, Waterloo, Ia.

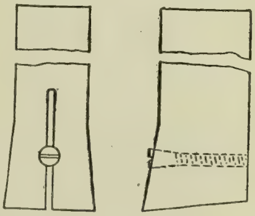

The Cover Retains Some of the Heat and Greatly Aids in Melting the Potash

Bending Cast Iron

Few mechanics know that cast iron can be bent or straightened, as the case may be. For example, take a piece of flat cast iron, place it on a level, solid surface and strike it lightly with a ball-peen hammer. If this simple experiment is tried, it will be found, to the surprise of the experimenter, that metal of this kind readily yields to the light blows of a hammer. Do not strike hard enough to break or crack the casting.

Adjusting the Cutting Edge of a Flat-Nosed Tool

A flat-nosed lathe or planer tool having a medium-width cutting edge can be adapted for slight adjustments in the following manner. When shaping the tool and when it is in an annealed condition, split the cutting edge with a hacksaw deep enough to prevent expansion and use a tapered-head screw for adjustment. When the corners of the cutting edge become worn, the edge can be adjusted for width by turning the screw.—Contributed by Chas. Hattenberger, Buffalo, N. Y.



Boning Rods for Laying Street Paving

A set of three boning rods is used to find the proper crown on which to lay the paving blocks. The rods are all alike with the exception that the target on the rod used in the center of the street is slightly different from those of the two others. Each rod is made of pieces described as follows: The center piece, or target standard, is made of a hardwood yard rule, that can be procured from a hardware or furniture dealer. These rules are usually 1 in. wide and ¼-in. thick. Holes are drilled in one edge as shown at A, Fig. 1, at each ¼-in. mark of the rule. The holes should be deep enough to receive the point of a screw, as shown in Fig. 2. That end of the yardstick which is to be used for the top has a small target, 3 by 2 by ¼ in., attached, through which, on the two side rods, there is a sighthole at the very edge of the yardstick. The center-rod target differs only in that its lower edge is cut level with the beginning of the first inch mark and that it has no sighthole.

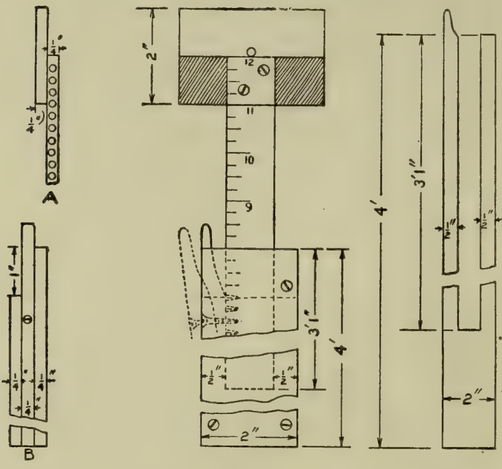


FIG. 1 FIG. 2 FIG. 3

The Parts and Their Dimensions for Constructing a Boning Rod to Determine a Street Crown

The lower end of the rod, or target-standard base, is made as shown in Fig. 3. Two sides, each ¼ in. thick, are screwed to the base part to make a rectangular hole for the target standard. The dimensions of the parts for the base are shown in Fig. 3 and at B, Fig. 1.

The rule is re-marked, starting with 12 at the sighthole, then 11 for the next, and so on to 0, which thus falls 1 ft. below the sighthole. These numbers should be made in red. The inch numbers below 0 are also changed, making the first 1, the next, 2, and so on to 12, which will be 2 ft. from the sighthole, the numbers being made in blue. The difference in colors is used in order to furnish an easy means of indicating whether a cut or a fill is needed.

To use the rods for laying crowns in streets where the curbs are in place, set the target standard in the two side rods at 0, as shown at BB, Fig. 4, and the center rod for the height of the crown at A, say 7 in. The two side rods are held, one on the outer edge of each gutter, and are used to sight through for the center target. A peg is driven in the center of the street, allowing so much of it to project above the ground

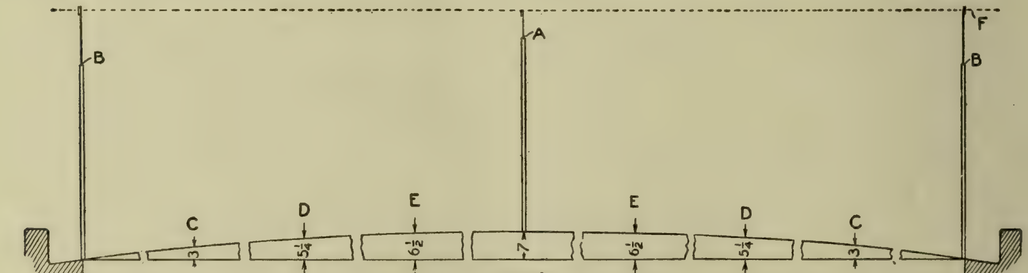


FIG. 4

The Three Rods as They are Used in Locating the Height of a Fill for the Center of a Street. Other Heights are Determined by Setting the Center Rods on the Points Indicated, after Setting the Target that the upper edge of the center-rod target, when this rod is placed on the peg, will line with the sightholes through the side-rod targets, as shown by the dotted line F. The stake is gradually driven in until this alinement is perfect, then the peg is marked.

The center rod is then used on points CC, DD, and EE, or the one-quarter, one-half and three-quarter distances of half the roadbed. The markings shown in Fig. 4 are for a 7-in. crown. Other points can be found in the table.

CORRECTION CHART, SAME FOR BOTH SIDES OF CENTER

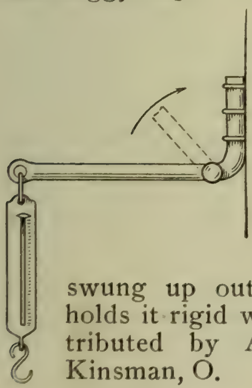
CROWN In.	GUTTER In.	¼ DIST. In.	½ DIST. In.	¾ DIST. In.	CENT'R In.
5	0	2¼	3¾	4¾	5
6	0	2½	4½	5½	6
7	0	3	5¼	6½	7
8	0	3½	6	7½	8
9	0	4	6¾	8½	9
10	0	4½	7½	9½	10

Table Showing Depths of Fills for the Division Marks on Street Crowns of Different Heights

The rods require only one setting for the whole length of the street for each point on the section. These rods are much better than a level, as no points need be reduced for the level, and once the rods are set, there will be no mistake made.—Contributed by Anton Henderson, Victoria, B. C.

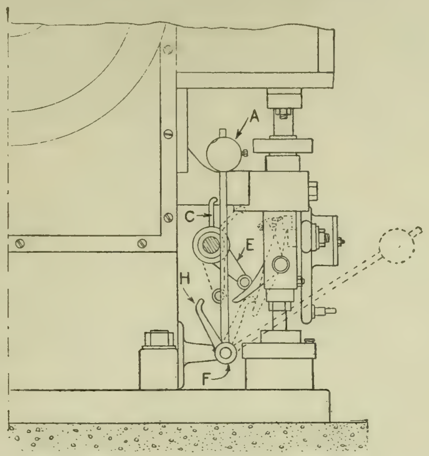
A Weighing-Scale Holder

A support for a spring scale can be made of a hinged brace taken from an old buggy top. The metal near the joint is bent up at right angles. The scale is fastened in the hole at the end. When stapled to the wall the construction of the joint permits the scale to be swung up out of the way, yet holds it rigid when in use.—Contributed by Aden K. Runkle, Kinsman, O.



Engine Safety Stop

A safety stop which was used successfully on an engine that had no provisions for automatically stopping it in case of a broken governor belt, is described by a correspondent of Power.



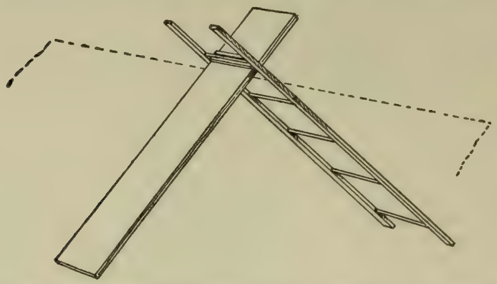
Safety Stop Used on an Engine to Work Automatically When a Governor Belt Breaks

This simple device, when not in service, is shown at A. It leans just enough to the left to prevent its falling over to the right. The knock-off bell crank E has a pin, C, in the top, with the end turned to come against the upright rod when the ball A is on top. As the bell crank moves down, the pin C will force the lever and ball slightly to the right and cause it to drop into the position shown by the dotted lines. The arm H, bearing against the catch-block arm, keeps the latter from hooking on and lifting the valve.

The bell crank E travels up and down as the governor rises and falls, and a pin in the end of E bears against the tail of the catch-block arm and, forcing the lower end, trips the valve. If the governor belt should break, the governor moves the bottom of the bell crank E toward the cylinder, but the part with the pin C travels away from the cylinder. The pin coming against the upright rod tips it over to the position shown by the dotted lines. The shaft F, on which is attached a similar lever at the crank end, extends to the opposite end of the cylinder.

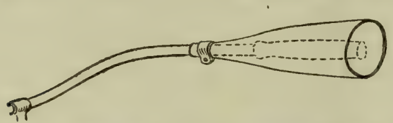
Holding a Ladder on Prepared Roofing

An ordinary ladder may be easily held on a prepared-paper or felt roof without damage to the material by using a holder made of a long board as shown. Ordinarily a board 12 ft. long is sufficient. Two cleats are nailed near one end to provide a notch for a rung on the ladder. The board is placed on one slope of the roof and the ladder on the other side.—Contributed by Fred L. King, Islip, N. Y.


The Ladder can be Placed on the Roof at Any Point for Making Repairs or for Other Work

Protector for the Motorcyclist's Hands in the Winter

Make a sleeve of soft leather, heavy oilcloth or canvas, about 1 ft. in length and large enough to cover the hand when it is on the grip. This is fastened to the handlebar with a clamp such as used for connecting garden hose, or one can be easily made of brass. If neither is at hand, wire can be used.—Contributed by C. A. Kotterman, Washington, D. C.

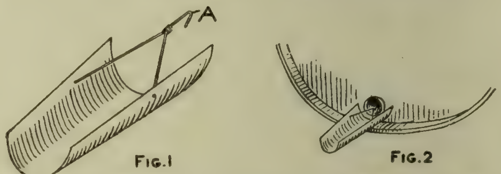

The Sleeve Attached to the Handlebar Protects the Hand from the Cold Air

Thawing a Frozen Radiator with an Electric Iron

When a radiator freezes, it may be quickly thawed by the use of an electric flatiron, says the Electrical World. Place the flat side of the iron against the radiator, allowing the handle to rest on the top of the valve, then insert a piece of wire between the radiator coils and around the iron, to hold it in position. When the current is turned on, the heat from the electric iron melts the ice and heats the water. This method has been applied successfully several times and will possibly assist someone having the same trouble.

Detachable Spout for a Barrel

It is very difficult to draw oil and distillates from metal drums or barrels by removing the screw cap without spilling a quantity of the liquids as the stream spreads over the projecting rim. A simple way to prevent this waste is to make a small tin spout, Fig. 1, with a wire hook, A. The spout can be easily attached to the drum by placing it on the rim under the opening and slipping the hook over the lower edge of the hole.—Contributed by W. A. Jaquythe, Richmond, Cal.

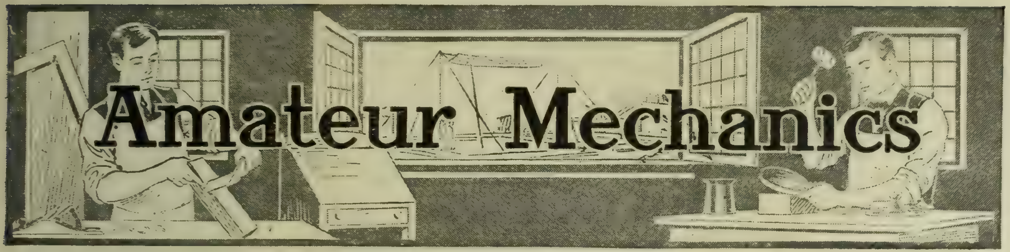


The Spout Carries the Liquid over the Extending Rim and Keeps the Stream from Spreading

How to Repair Linoleum

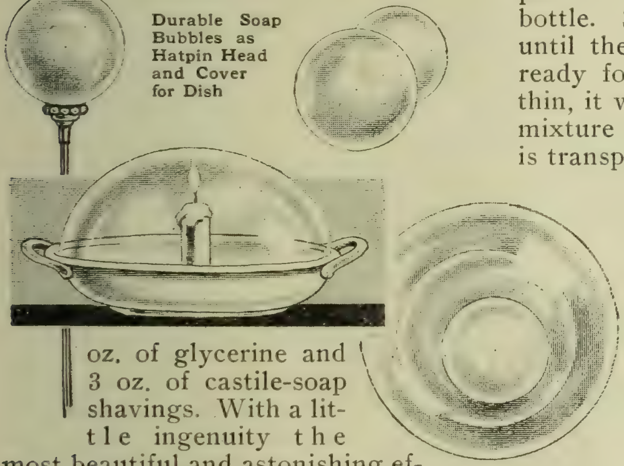
A deep crack or fissure right in front of the kitchen cabinet spoiled the appearance of the new linoleum. The damaged spot was removed with a sharp knife and from a left-over scrap a piece was cut of the same outline and size. The edges were varnished and then the patch was set in the open space. The linoleum was given a good coat of varnish making it more durable. When perfectly dry, the piecing could not be detected.—Contributed by Paul Keller, Indianapolis, Indiana.

¶Spare tire casings should be carried in a dark casing cover as sunlight has an injurious effect on rubber.



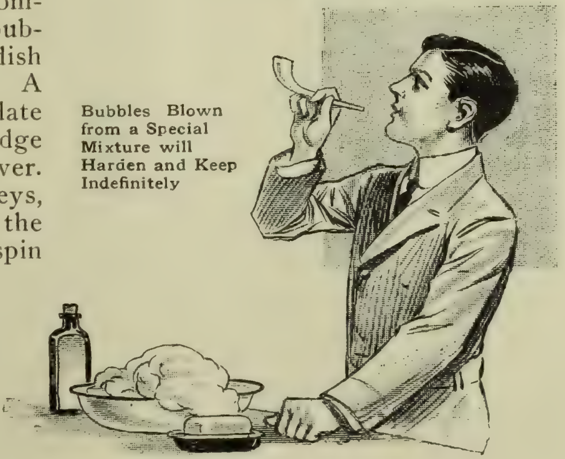
Blowing Durable Soap Bubbles

SOAP bubbles that will keep 48 hours and can be handled without breaking, are blown with a solution made as follows: Mix 12 oz. of water with 6 to 9 oz. of glycerine and 3 oz. of castile-soap shavings. With a little ingenuity the most beautiful and astonishing effects can be produced with the bubbles. Blow a bubble and let it fall into a glass dish, in which a little vinegar and common soda have been placed. The bubble will remain suspended in the dish apparently supported on nothing. A bubble can be placed over a dish, plate or pan so that it fits the outside edge and appears to be an oval top cover. With practice one can drop roses, keys, pins, etc., through the bubble into the vessel, or set a lighted candle, or spin a top in the bubble. A small bubble can be filled with smoke and a larger bubble placed around it, and then both put inside of a still larger bubble.


Durable Soap Bubbles as Hatpin Head and Cover for Dish

To make imitation-pearl hat and stick pins, use the following solution for the bubbles. Procure some celluloid film from a druggist, also 2 oz. of acetone. Put the film in a wide-mouth 3-oz. bottle, mix some powdered soap with the acetone and pour it over the celluloid film in the bottle. Set aside for a day or two, or until the film is dissolved, when it is ready for use. If the solution is too thin, it will appear white. The proper mixture should be a thick syrup which is transparent when dry.

Use a pipe to blow the liquid into bubbles, just as when blowing the ordinary soap bubbles, but do not blow them too large. After blowing them to the size wanted, stop up the hole in the pipestem and hang pipe and bubble where they will not be injured, until the bubble hardens. Soak some fish scales in ammonia and fill small bubbles with them


Bubbles Blown from a Special Mixture will Harden and Keep Indefinitely

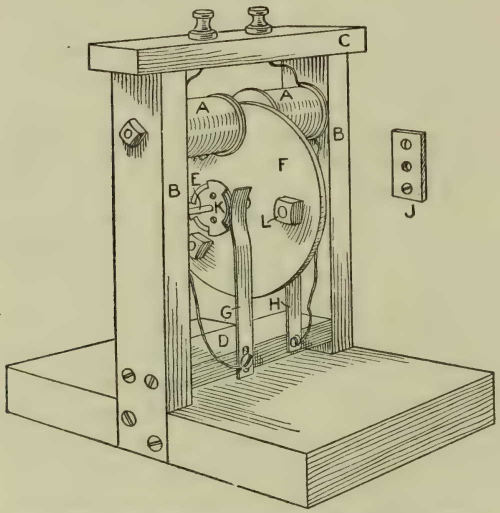
and the bubbles will look like large pearls. Bubbles filled with camphor and water, or with smoke, make beautiful curios.

When mixing or using this solution do not keep it near a fire or a lamp, as it will burn, the celluloid being the inflammable material. When not in use, keep the bottle tightly corked, as the fluid will evaporate if exposed to the air. Acetone is sometimes labeled poison, but it is poisonous only when taken internally.—Contributed by J. G. Allshouse, Avonmore, Pa.

A Homemade Toy Motor

A motor that will develop sufficient power to drive toy machinery can be made by the average boy in the following manner:

The cores of the magnets, AA, are two carriage bolts, ¼ by 2¼ in. The magnets are constructed by placing two wood washers, 1 in. in diameter, on each bolt, spacing them 1⅛ in. apart, and then filling the space with No. 22 single or double-cotton-covered magnet wire. Before winding the wire the core should be covered or insulated with three or four layers of paper. Allow about 5 in. of the wire ends to project from the winding for making connections.



A Motor That Uses Current from a Small Battery and is Capable of Driving Toy Machinery

The frame is made of ½ by 1-in. wood. The uprights BB are 6 in. long; the top crosspiece C, 5 in. long, and the lower crosspiece D, 3 in. long. The base is a piece of wood, 4 in. wide, 6 in. long and 1 in. thick.

The shaft E is a piece of copper or brass rod—preferably brass—to which a disk, F, 3 in. in diameter and cut from sheet zinc, copper, brass or aluminum, is soldered. The brushes G and H are made of brass or copper, 2½ in. long. The brush G has a slot for the holding screw so that it may be adjusted on the commutator contacts to obtain the desired speed. The bearings for the ends of the shaft are constructed as shown at J, and are screwed to the inside surfaces of the uprights BB.

The commutator, or circuit breaker, K is made of brass, cut with three projections as shown and soldered to the shaft with the projections at a point almost but not quite midway between the armatures L, which, also three in number, are spaced at equal distances on the 3-in. disk and near its circumference. They are ordinary short machine or stove bolts placed in holes in the disk. Two binding posts are placed on top of the crosspiece C for the connections to the source of current. The upper end of the brush H bears on the shaft for its contact. The current passes through the magnet coils and then to the brushes as shown by the connecting wires.—Contributed by Theo. Krueger, Peoria, Ill.

Waterproofing Shoe Soles

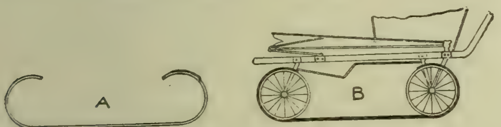
A waterproofing material for shoe soles is made of equal parts of beeswax, resin and vaseline mixed together by heating in the same manner as glue. When melted, add kerosene until the mixture has the consistency of cream. Heat the shoe soles a little and cover them with the mixture.—Contributed by Frank Kershner, Normal, Ill.

How to Clean Jewelry

To cleanse articles of silver, gold, bronze and brass use a saturated solution of cyanide of potassium. To clean small articles, dip each one into the solution and rinse immediately in hot water; then dry and polish with a linen cloth. Larger articles are cleaned by rubbing the surface with a small tuft of cotton saturated in the solution. As cyanide of potassium is a deadly poison, care must be taken not to have it touch any sore spot on the flesh.—Contributed by G. A. Koerbis, U. S. S. "Vermont."

Runner for a Go-Cart

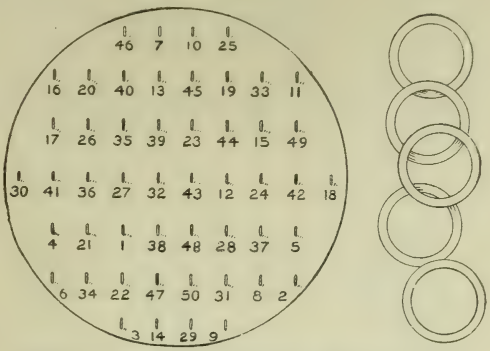
As the wheels of a go-cart do not push through the snow very easily and the cart, therefore, does not run in a straight direction, and as I did not care to purchase a sled, I instead fitted the go-cart wheels with runners as shown in the sketch. I purchased a piece of machine steel of a diameter to fit the grooves in the wheels after the rubber tires were removed. This I cut and bent to the shape shown at A, making two runners, and applied one to each pair of wheels, front and rear, as shown at B. The runners kept the wheels immovable and caused the cart to glide over the snow as a sleigh. This runner will not interfere with the folding of a collapsible cart.—Contributed by Roy B. Hanaford, Detroit, Mich.



The Runners are Easily Applied to the Wheels of a Go-Cart and Hold Them Solidly

A Ring-Throwing Game

The board for this game is made of a cover from an old candy or lard pail, washed and painted black. When the paint is dry, place 50 pegs on the surface as shown and number them with white paint or by fastening numbers cut from paper below them. The numbering of the pegs is not consecutive, but low and high numbers distributed with the object in view of making it difficult to secure a high score.

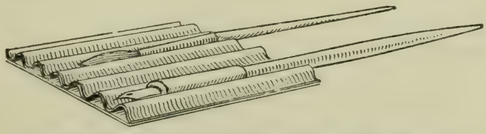


The Candy-Pail Cover with Pegs Numbered and a Set of Rings for Each Player

Each player has a set of five rings, which are nothing else but rubber fruit-jar rings. These can be purchased at a grocery store. The board is hung on a wall or post, and the player stands about 5 or 6 ft. away and throws the rings, one at a time, trying to ring pegs having the highest numbers. The sum of the numbers corresponding to the pegs ringed counts toward the final score. Turns are taken by each player, and each time five rings are thrown. The score can be set at any amount, 500 being about right.—Contributed by Francis P. Hobart, Willoughby, O.

A Pen and Brush Holder

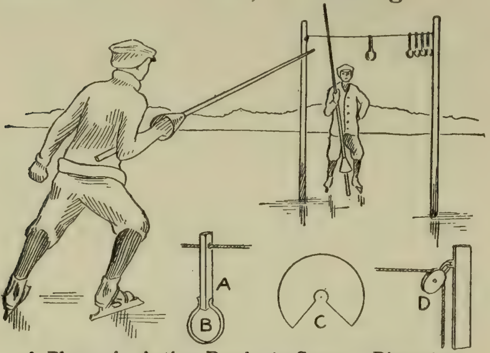
A sheet of corrugated paper is a handy thing to have on the writing desk, for the purpose of placing wet pens or brushes in its grooves. The paper absorbs the liquid, and the corrugations hold the pens or brushes in handy positions. A sheet of this paper is almost as useful a desk accessory as a blotter.—Contributed by James M. Kane, Doylestown, Pa.



The Depressions in the Paper Hold the Pens or Brushes and Also Absorb the Excess Fluid

A Game Played on the Ice

A novel and interesting winter game for young and old, described as a novelty by a Swedish paper, is played as follows:



A Player in Action Ready to Spear a Ring that Hangs on the Line between the Poles

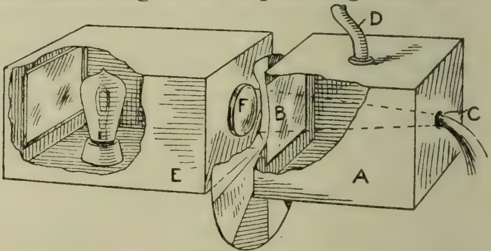
Two poles of convenient height are erected on the ice; if skating on a shallow pond they may be driven through the ice and into the ground, but if the water is deep, holes must be bored through the ice and the poles will soon freeze solidly in them. A rope is stretched between the poles at such a height as is suited to the size of the players, or as agreed on to make the game more or less difficult, and on this are strung a number of pieces of board, A, each having a ring of spring steel, B, attached to its lower end. The purpose of the game is to run at good speed between the poles and catch a ring on a spear, each player being entitled to make a certain number of runs, and the winner being the one who can catch the most rings.

The spears may be made of broom handles tapered toward one end, and with a shield made of tin and attached at a suitable distance from the thicker end (Pattern C). The line is fastened at the top of one pole and run through a pulley, D, at the top of the other, thence to a weight or line fastener. Each player should start from the same base line and pass between the poles at such a speed that he will glide at least 100 ft. on the other side of the poles without pushing himself forward by the aid of the skates. Twenty runs are usually allowed each player, or 10 players may divide into two parties, playing one against the other, etc. An umpire will be needed to see that fair play is maintained and settle any disputes that may arise.

An Electric Display for a Show Window

A novel window display that is very attractive, yet simple in construction and operation, can be made in the following manner: First, make a small watertight chamber, A, as long as the focal length of the lens to be used, and having a glass window, B, at one end, and a small round opening, C, at the other. In this opening is placed a cork through which a glass tube about 2 in. long is inserted. The tube makes a smooth passage for the stream of water flowing out of the box. Water from any source of supply enters the chamber through the tube D, which may be a pipe or hose, whichever is most convenient. The interior is painted a dull black.

A convenient and compact light is placed at the window end of the box. A very good light can be made by placing an electric light with a reflector in a closed box and fastening a biconvex lens, F, in the side facing the window of the water box. When the electric light and the water are turned on, the light is focused at the point where the water is issuing from the box, and follows the course of the stream of water, illuminating it in a pleasing manner.



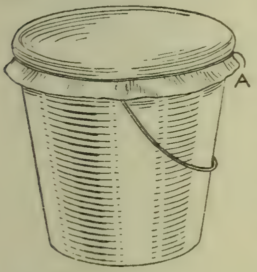
The Arrangement of the Boxes Showing the Path of the Light Rays through the Water

A still better effect can be obtained by passing colored plates between the lens F and the window B. A glass disk with sectors of different colors may be revolved by any source of power, such as a small electric motor or even a waterwheel turned by the flowing water.

Two or three streams of water flowing in different colors make a very pretty display and may be produced by using two or more boxes made up in the same manner. The apparatus should be concealed and nothing but the box end or tube with the flowing water shown.—Contributed by Grant Linton, Whitby, Ont.

Strainer for a Milk Pail

Even though a milker may be careful, small particles of dirt, hairs, etc., will fall into the milk pail. It is true that the milk is strained afterward, but a large percentage of the dirt dissolves and passes through the strainer along with the milk. The best plan to prevent this dirt from falling into the milk is to put a piece of cheesecloth over the pail opening, securing it there by slipping an open wire ring, A, over the rim. The milk will readily pass through the cloth without spattering.—Contributed by W. A. Jaquythe, Richmond, Cal.

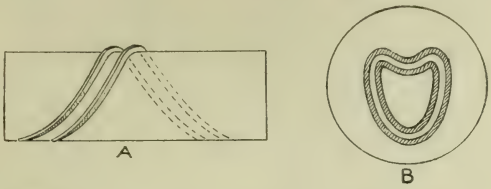


Baking Bread in Hot Sand

A driving crew on the river wanted to move camp, but the cook objected as he had started to bake. One of the party suggested using a modified form of the method of baking in vogue more than a century ago, which was to place the dough in the hot earth where a fire had been burning. So, to help the cook out, a barrel was sawed in half and the bread, after being properly protected, was placed in each half barrel and covered with hot sand. Two of the men carried the half barrels on their backs. When the new camp was reached the bread was done.—Contributed by F. B. Ripley, Eau Claire, Wis.

How to Make Small Cams

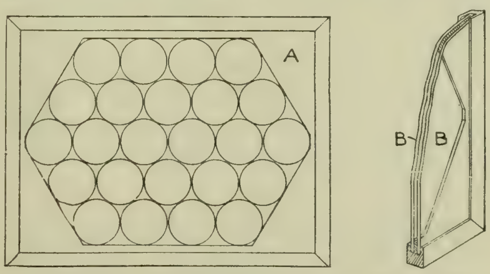
In making models of machinery or toy machines, cams are very often required. A simple way of making these is to lay out the cam plate, or drum, and then bend pieces of brass to the correct shape and solder them in place, whereupon they may be smoothed up with a file or scraper. A cam of this sort on a drum is shown in the sketch at A, and on a faceplate, at B. The method is not quite as accurate as milling, but answers the purpose in most cases.—Contributed by Chas. Hattenberger, Buffalo, N. Y.



Channels of the Cams Formed with Strips of Brass Soldered to the Drum or Disk

Display Holder for Coins

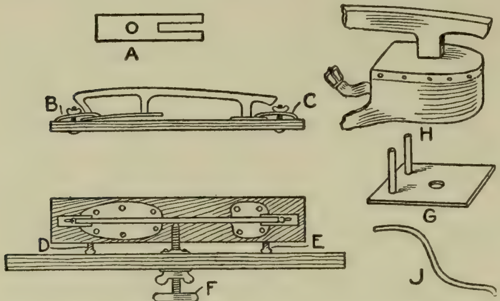
If the luster of coins fresh from the mint is to be preserved, they must be immediately placed so as to be protected against contact with the hands. A good holder that will display both sides of a coin can be made of two pieces of glass, BB, between which is placed a cardboard cut as shown at A. The cardboard should be about the same thickness as the coins. The glass may be framed by using strips of wood rabbeted to receive the edges of both pieces; or their edges may be bound with passe-partout tape. Even when a frame is used, it is best to bind



Two Pieces of Glass Inclosing between Them Coins of the Same Size and Thickness the edges as this will prevent tarnish from the air. Old negative glass is suitable for making the holder.—Contributed by R. B. Cole, New Haven, Conn.

Holder for Skates while Sharpening

The base of the holder is cut from a board and should be about 3 in. longer than the skate. Two clamps are cut as shown at A, from metal of sufficient thickness to hold the skate firmly, then bent to shape and attached to the baseboard with bolts having wing nuts, as shown at B and C.



The Holder Provides a Way to Grind a Slight Curve in the Edge of a Skate Blade

One edge of the board is provided with two pins, D and E, solidly fastened, which are of sufficient height to bring the center of the blade on a level with the grinder axle. An adjusting screw, F, is provided for the grinder base to adjust the skate blade accurately. The support G is for use on baseboards where skates with strap heels, H, are to be sharpened. The shape of the clamp for this support is shown at J.

When the skate is securely clamped to the base the blade can be easily "hollow ground" or given a slight curve on the edge.—Contributed by C. G. Smith, Brooklyn, N. Y.

A Homemade Direct-View Finder for Cameras

Every hand camera and most of the tripod cameras are equipped with finders of one type or another, and usually one in which the image of the field is reflected upward on a small ground glass—being, in fact, a miniature camera obscura. The later and generally more approved style of finder has a small concave lens conveniently set on the outer edge of the camera. When this direct-vision type of finder is used, the camera is held so that the finder is at the height of the eye, a condition that is particularly desirable. When in a crowd, of course, the professional and many amateurs are familiar with the method of holding the camera inverted over the head and looking up into the finder to determine the range of the field. Even this method is inconvenient, often impractical.

The up-to-date newspaper photographer insists on having his camera equipped with direct finders, as it saves him much trouble and many failures. Anyone with a little ingenuity can change one of the old-type finders into a combination device, either direct or indirect. The sketches are self-explanatory, but it may be said that Fig. 1 represents a box camera with a regulation finder set in one corner of the box. To make it a direct finder, a small brass hinge is used. Cut off part of one wing, leaving a stub just long enough to be attached to the front of the camera directly above the lens of the finder and so as not to interfere with it, and high enough to permit the other wing to be turned down on the ground glass, with space allowed for the thin glass mirror A, that is to be glued to the under side of the long wing. The joint of the hinge should work quite stiffly in order to keep it from jarring out of any position in which it may be set.

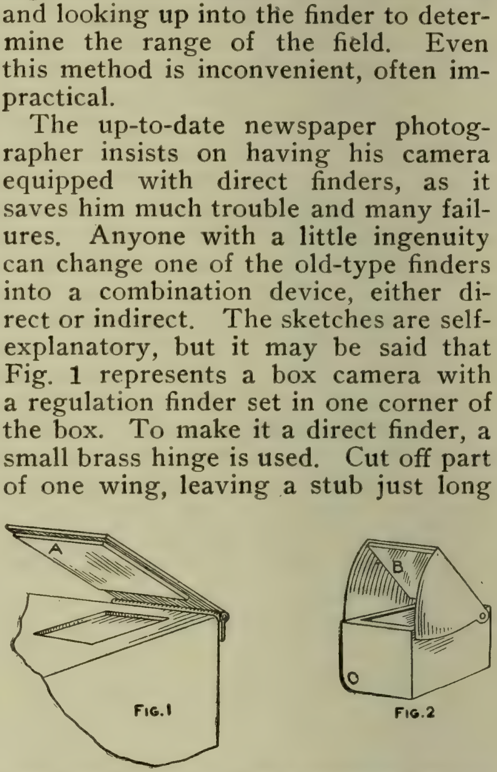


Fig.1

Fig.2

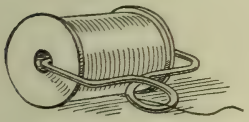
Two Types of Ordinary View Finders and Methods of Converting Them into Direct-View Finders

If the wing is turned upward at an angle of 45 deg., the finder can be used as a direct-vision instrument when held at the height of the eyes. The image reflected from the small mirror is inverted, but this is no disadvantage to the photographer. The small pocket mirror given out for advertising purposes serves very well for making the reflecting mirror.

The finder shown in Fig. 2 is another very common kind, and one that is readily converted into the direct type by inserting a close-fitting mirror, B, on the inside of the shield to be used as a reflector of the finder image. If the mirror is too thick, it may interfere with the closing of the shield, though in many cases this is not essential, but if it should be necessary to close down the shield in order to fold the camera, it can usually be readjusted to accommodate the mirror.

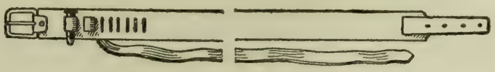
A Non-Rolling Spool

Bend a piece of wire in the shape shown in the illustration and attach it to a spool of thread. The ends of the wire should clamp the spool slightly and the loop in the wire will keep it from rolling. Place the end of the thread through the loop in the wire and it will not become tangled.—Contributed by J. V. Loeffler, Evansville, Ind.



How to Make a Cartridge Belt

Procure a leather belt, about 2½ in. wide and long enough to reach about the waist, also a piece of leather, 1 in. wide and twice as long as the belt. Attach a buckle to one end of the belt and rivet one end of the narrow piece to the belt near the buckle. Cut two slits in the belt, a distance apart equal to the diameter of the cartridge. Pass the narrow leather piece through one slit and back through the other, thus forming a loop on the belt to receive a cartridge. About ¼ in. from the first loop form another by cutting two more slits and passing the leather through them as described, and so on, until the belt has loops along its whole length.



Two Pieces of Leather of Different Widths Forming a Belt for Holding Cartridges

The end of the narrow leather can be riveted to the belt or used in the buckle as desired, the latter way providing an adjustment for cartridges of different sizes.—Contributed by Robert Pound, Lavina, Mont.

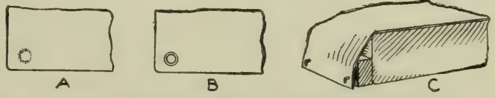
Removing Iodine Stains

A good way to chemically remove iodine stains from the hands or linen is to wash the stains in a strong solution of hyposulphite of sodium, known as "hypo," which is procurable at any photographic-supply dealer's or drug store.

There is no danger of using too strong a solution, but the best results are obtained with a mixture of 1 oz. of hypo to 2 oz. of water.

Bed-Cover Fasteners

The arrangement shown in the sketch is easily made and will keep the bed covers in place. The covers are provided with eyelets, either sewed, A, or brass eyelets, B, 6 or 8 in. apart along the edge. A wood strip, C, 3 by 1½ in., is cut as long as the width of the bed and fastened to the frame with wire, bolts, or wedges. Screwhooks, about 1¼ in. long, are turned into the strip so that they will match with the eyelets placed in the covers. Thus the covers will be kept in place when the bed is occupied, and the bed is also easily made up.—Contributed by Warren E. Crane, Cleveland, O.



The Hooks Prevent the Covers from Slipping Off the Sleeper and Keep Them Straight on the Bed

How to Make an Electric Lamp Flasher

Procure two pieces of metal, one of brass and the other of sheet iron, 5 in. long, ½ in. wide, and $\frac{1}{32}$ in., or just a little more, in thickness. Bend the brass strip into the form shown in Fig. 1, then place the brass piece on top of the iron and drill the holes A and B indicated in Fig. 2. After the brass piece has been bent, as shown in Fig. 1, it will of course be shorter than the iron strip and the iron strip must be cut off, or a brass strip a little longer than 5 in. can be secured and cut the same length as the iron strip after it is bent. The holes A and B should be $\frac{3}{32}$ in. in diameter. The next thing to do will be to wind a heating coil about the brass strip. Wrap a very thin layer of sheet asbestos about the brass strip, and wind on the strip 18 ft. of No. 34 gauge bare superior resistance wire. Use a thread about .006 in. in diameter to separate the various turns. This thread can be removed after the winding is completed and the ends have been fastened. Rivet the iron and brass pieces together with a small brass rivet in the hole A, Fig. 2. After the two pieces are riveted together bend them into the form shown in Fig. 4 and then drill the two ⅛-in. holes C and D, as shown in Fig. 2. Tap the hole B, Fig. 2, to take a small machine screw.

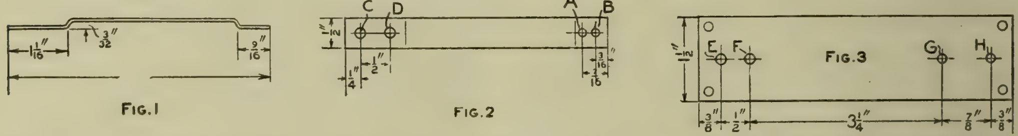


FIG. 1

FIG. 2

FIG. 3

Dimensions of the Brass Strip and Mounting Base, Showing the Location of the Holes and the Shape of the Brass Strip to Receive the Coil of Wire

The base is constructed as follows: Procure a piece of slate, 5⅜ in. long, 1½ in. wide, and ½ in. in thickness. Drill the holes indicated in Fig. 3. The four corner holes are for mounting the flasher in its containing case, and should be about ⅛ in. in diameter. The holes E, F, G, and H should be ⅛ in. in diameter and countersunk with a ⅜-in. square-ended drill, on the under side, to a depth of $\frac{3}{16}$ or ¼ in. Cut from some $\frac{1}{16}$-in. sheet brass a piece 1⅜ in. long, and ½ in. wide. Drill two ⅛-in. holes in this piece, ⅞ in. apart and equally spaced from the ends. Procure four ⅛-in. brass bolts, two ½ in. in length, and two 1 in. in length. Secure four small washers and two additional nuts. Mount the combined iron and brass strip on the slate base, using a long and short bolt as shown in Fig. 4. One terminal of the winding should be placed under the head of the bolt J. Place a washer, K, between the head of the bolt and the wire. The brass strip L can now be mounted in a similar manner, as shown in Fig. 4. Place the other end of the winding under the head of the bolt M.

Obtain a small screw, N, Fig. 4, of such a length that its point will reach the brass strip L when the screw is placed in the hole B, Fig. 2. A lock nut, O, should be provided for this screw so that it will remain in adjustment. The point of the screw and the point on the brass plate where the screw touches should be of platinum, as the brass will not withstand the high temperature of the arc formed when the circuit is broken.

A metal box should now be provided to serve as a containing case and the flasher is complete. This box should be of such design and construction that it will comply with the requirements of the electrical inspection department having jurisdiction over the locality where the flasher is to be used.

The flasher should be connected in series with the lamp, the wires being fastened under the nuts on the bolts P and R, Fig. 4, and the screw N adjusted so that it lacks a small fraction of an inch of making contact with the brass plate when there is no current in the winding. When the switch is turned on there will be a current through the lamp and winding in series. The brass strip will be heated more than the iron and it will expand more, thus forcing the point of the screw N down upon the brass plate, which will result in the winding about the brass strip being shorted and the full voltage will be impressed upon the lamp, and it will burn at normal candlepower. When the coil is shorted there will of course be no current in its winding and the brass strip will cool down, the screw N will finally be drawn away from contact with the brass plate, and the winding again connected in series with the lamp. The lamp will apparently go out when the winding is in series with it, as the total resistance of the lamp and winding combined will not permit sufficient current to pass through the lamp to make its filament glow. The time the lamp is on and off may be varied to a certain extent by adjusting the screw N.

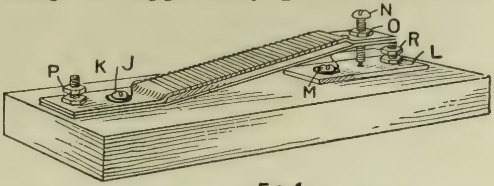


FIG. 4

The Assembled Parts Showing the Complete Flasher and Electric Connections with Adjusting Screw

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Timing Photograph Prints

An amateur photographer insists that a timing clock in the darkroom is a needless luxury. In order to time printing exposures, which he does with a pendant tungsten light under a reflecting shade, he simply fastens the electric-light cord so that the lamp and shade will act like a pendulum bob which beats the seconds. Of course he makes no effort to be exact, but if the distance between the lamp and the point of suspension of the cord be about 39 or 40 in., the beats will be very nearly seconds. When the light is turned on, it is started swinging, and the operator can thus easily count seconds with sufficient accuracy, and, besides, it readily furnishes a guide for duplicating printing results.

The same principle can be applied to camera exposures, if so desired, by the following plan. Select some suitable place on the under side of the tripod plate, as, for instance, the screw head, and fasten a small string, having a weight attached to it about 39 in. from the point of support. Like the swinging lamp, this device too, will beat seconds. For convenience, one of the tripod legs may be marked to indicate the length of string needed, so that the operator at any time can quickly fasten a string, measure off the right length on the tripod leg, attach a bunch of keys, a knife, or any other convenient weight, even a small stone, and have a second-beating pendulum for time exposures.—Contributed by F. B. Lambert, Chicago.

Supports for Camp-Fire Utensils

The sketch shows how to make a standard or support to hold cooking utensils over a camp fire. The main part or stake is made of a piece of gas pipe, on one end of which is turned an ordinary coupling, Fig. 1. This is used to furnish a strong head when the stake is driven into the ground. The rings and supports for the utensils are made of heavy wire bent into the shape required to hold the respective vessels. The sketch, Fig. 2, shows the manner of shaping the wires.

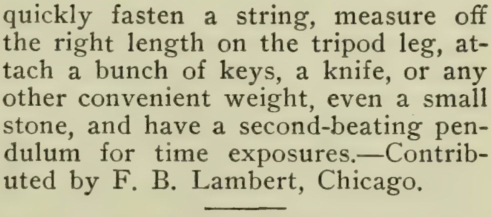
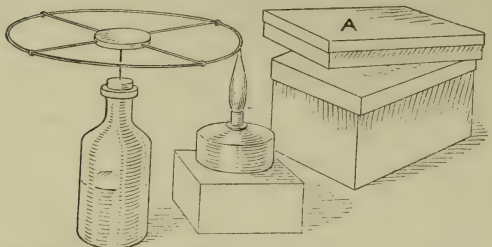


FIG. 1 FIG. 2

A Piece of Gas Pipe Constitutes the Standard with Wires Attached for Holding the Utensils

A Mysterious Revolving Wheel

The mystery of this wheel is that it seems to revolve automatically without any visible external power. It is at the same time an amusing trick and an instructive experiment. The apparatus required is very simple and can be made at home.



The Wheel as It is Mounted on a Needle, and Lamp and Box Containing Magnet to Make It Turn

A glass bottle is half filled with sand and water, so that it will stand securely, and a cork placed in the neck. Into this cork a needle should be inserted so that it projects perpendicularly, which is most easily done by heating one end of the needle to a red heat and then pushing it into the cork as deeply as possible. Into a disk of cork of suitable thickness and at four points on its side, at equal distances apart, are inserted four pieces of copper wire of the same length, each bent at the outer end to form a hook—these copper wires thus forming the spokes of the wheel. The rim is made of a small iron wire bent in a circular shape and held in the hooks on the ends of the copper wires. The now completed wheel is balanced on the free point on the needle, so that it can turn easily.

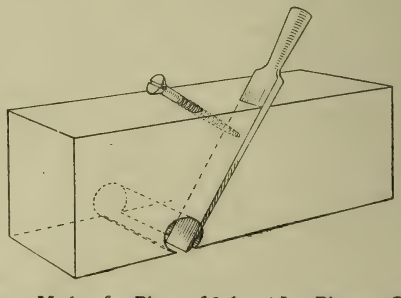
Place an alcohol lamp in such a position that when it is lighted the tip of the flame will just reach the rim of the wheel. (Any other flame that will not soot the rim may be used.) In the box A, placed with its bottom level with the wheel, put a horseshoe magnet so that the flame is opposite one of its poles. After the lamp has been lighted for a few seconds, the wheel will begin to revolve, seemingly without cause. Why does it do so? Because the magnet magnetizes or attracts the part of the ring nearest it while cold, but not when it is glowing. Instead, it will attract the cooler part of the ring nearest behind the flame and so on, the wheel thus spinning round, faster in the same proportion as the magnet is stronger and the iron rim smaller.

If this experiment is shown before spectators as a trick, the performer may say to the audience that he alone can make the wheel spin around without touching it. Should some one accept his challenge, he may, in a careless way, move the box containing the magnet away or turn it around so that it will not influence the iron ring and then, of course, the wheel will remain immovable.

How to Make a Rabbet Plane

A rabbet plane is very little used by mechanics, but when it is wanted for a piece of work, it is wanted badly. While doing an unusual piece of work I needed a rabbet plane, and having none, I made a plane as shown in the sketch in less time than it would have taken to go out and borrow one.

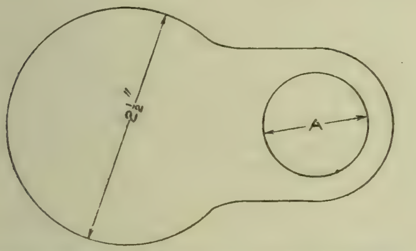
The body of the plane was made of a piece of 2 by 4-in. pine, 1 ft. long. A 1-in. chisel was used for the bit. A place was marked on one side of the wood to be cut out for the chisel, and a 1-in. hole bored through, the narrow way, so that one edge of the bit cut through the bottom, forming a slit for the edge of the chisel. After cutting a groove for the chisel blade and turning in a long wood screw as shown,



A Plane Made of a Piece of 2 by 4-In. Pine, a Chisel and a Large Wood Screw to hold the chisel in place, I had as good a rabbet plane as could be purchased.—Contributed by W. H. Young, Thompson, Ga.

Eye Shield for a Microscope

The difficulty and discomfort amateurs experience in learning to use a microscope with both eyes open, or in trying to keep one eye shut, can be easily overcome by attaching a piece of cardboard, similar in shape to the one shown in the sketch, to the barrel of the microscope. The hole A should be of sufficient diameter to allow the cardboard to slide freely up and down on the barrel to the proper adjustment. This simple arrangement will relieve a great deal of the eye strain and will be of assistance to the most experienced users of microscopes.—Contributed by G. B. Fenton, Charleston, W. Virginia.



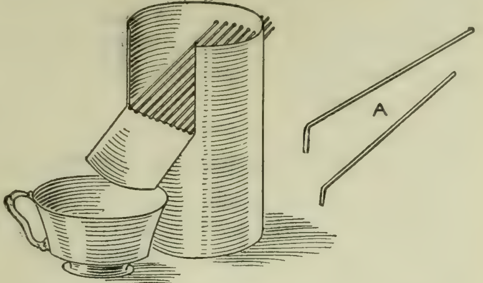
Shield to Cover the Eye That is Not Used When Looking into a Microscope

Transferring Magazine Pictures

Select pictures from newly printed papers and magazines. Rub wax from a paraffin candle over a sheet of clean white paper, covering a space as large as the picture to be copied. Place the paper, waxed side down, on the picture and while holding it firmly with the fingers of one hand, rub the back thoroughly with some hard substance until all parts of the picture have been gone over. Remove the paper and a perfect copy of the picture will be found upon the waxed side.—Contributed by Kenneth G. Merlin, Brooklyn, N. Y.

A Homemade Egg Separator

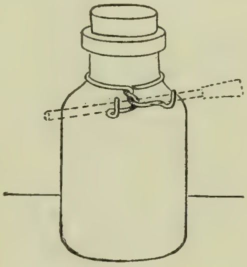
Secure some small wire and a very large can. Cut the wire into several pieces and bend them as shown at A, cut the can and bend the side down as shown and punch holes to receive the upper ends of the wires. Make the holes so that the wires will be about 5/16 in. apart.



The Contents of the Egg is Placed on the Wires Which will Separate the Yolk from the White

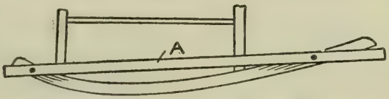
A Glue-Spreader Holder

The spreader that is supplied with bottles of liquid glue should not be placed on any surface, as it will soon stick to it. A holder that will keep the spreader in a safe place can be made of a piece of wire which is twisted about the neck of the bottle, as shown in the sketch, and the ends bent up to receive the spreader.



Stop on a Chair Rocker for a Baby

For a baby, too small to rock without tipping the chair over, a small willow or other suitable rocking chair may be made safe in the following manner:



The Strip on the Rocker Prevents the Child Tipping the Chair Too Far Either Way

A strip, A, is fastened on the outside of the rocker with small screws so that it may be removed without injuring the chair. A rubber-covered tack driven in on the under side at each end of the strip modifies the shock and the baby can rock to its heart's content without danger of turning over.—Contributed by Mrs. G. W. Coplin, Bay City, Mich.

Homemade Countersink for Wood

A round or flat-head bolt can be made into a good rosebit or reamer for countersinking holes for screw heads.

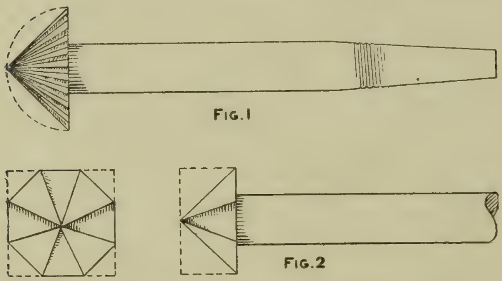


FIG. 1

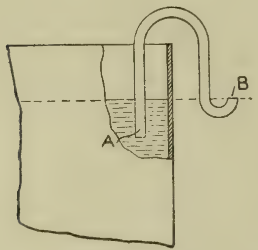
FIG. 2

Round and Square Heads of Bolts Shaped and Notched to Make Countersinks

In the illustration, Fig. 1 shows a reamer made of a round-head bolt, and Fig. 2, one made of a square-head bolt. The round-head makes the best reamer as more cutters can be filed in the surface and less work is required to file it into shape.

To Maintain a Constant Level of Liquids in Vessels

It is frequently desirable in laboratory experiments, and in practical work as well, to maintain a constant level in a tank without allowing it to become full. In many cases an outlet pipe at a certain height in the side of the tank is not desirable, and in laboratory experiments with beakers or crocks is, of course, impossible.



The diagram shows a simple but effective constant-level device. The outer end of the inverted U-tube is curved upward so that it never empties. If desired, the upward curve may be omitted and the straight end immersed in a small vessel of water. All that is necessary now for the successful working of the device is that the inner or tank end, A, of the tube be lower than the outer end—in other words, below the level of the end B—and the inner end below the level of the fluid. Of course, the U-tube must be first filled with liquid and will then act as an intermittent, never-breaking siphon. Should the tank fill above the end B, the siphon drains the fluid down to that level and no lower, even if the inner leg of the tube reach the bottom. To maintain this level against loss by evaporation some slight inflow is necessary.

It will be noted that if the inner end of the siphon were above the outer end, the siphon would break as soon as the liquid in the tank fell to the inner mouth.—Contributed by Harry N. Holmes, Richmond, Ind.

Homemade Electric Bed Warmer

The heat developed by a carbon-filament lamp is sufficiently high to allow its use as a heating element of, for instance, a bed warmer. There are a number of other small heaters which can be easily made and for which lamps form very suitable heating elements, but the bed warmer is probably the best example. All that is required is a tin covering which can be made of an old can about 3½ in. in diameter. The top is cut out and the edge filed smooth. The lamp-socket end of the flexible cord is inserted in the can and the shade holder gripped over the opening. A small lamp of about five candlepower will do the heating.

A flannel bag, large enough to slip over the tin can and provided with a neck that can be drawn together by means of a cord, gives the heater a more finished appearance, as well as making it more pleasant to the touch.

PATENTS, PRACTICAL OR UNIQUE

CALENDAR PEN—A penholder containing an adjustable calendar is shown in Fig. 1. The barrel within the holder has five separately revolving sections, the lower three of which contain the customary abbreviations of the months' names, while the remaining two contain numerals.

EXPANSION BRACELET (British patent) — An expansion bracelet comprising a band having its ends pivoted to a connecting link is shown in Fig. 2.

COMBINED ELECTRIC LAMPS AND TRANSFORMERS (British patent)—In Fig. 3 are shown two types of combined electric lamps and transformers, in one of which the transformer is arranged within the bulb itself, while the other is in a vacuum chamber connected directly to the bulb. In the former, a horseshoe-shaped ring is hung over the transformer, the bar at the bottom being the incandescent element. In the other the filament hangs from the transformer ring and is inclosed in a bulb of the customary shape.

PEN RELEASER (German patent)—Figure 4 is a penholder having a little lever arrangement at its base by means of which the pen proper may be dropped from the holder by the simple pressure of the thumb.

PIN-FEATHER PICKER—The removing of pin feathers from a fowl is usually left by the farmer for the butcher, and the butcher, in his turn, leaves this disagreeable task for the purchaser of the bird. In Fig. 5 is shown an implement designed to make the removal of pin feathers easy.

TIRE-PUNCTURE FINDER—Figure 6 is a device designed for finding leaks in pneumatic automobile tubes. The tube is drawn through the ring, which is several inches wide, and has its interior divided into two annular air chambers. When a punctured portion of the tube is drawn through, the escaping air passes through a flexible tube into a bottle containing water, the bubbles rising in the bottle indicating a leak in that section of the tire.

COTTON-PICKING GLOVE—Figure 7 is a cotton-picking glove held in position on the hand by means of a wire bracelet at the wrist, and having wire claws at the ends of the fingers and thumb.

SPRAY MOP HEAD (British patent)—A spray mop head for use in washing windows, automobiles, carriages, and the like, is shown in Fig. 8. The handle of the device, through which a pipe is run, is attached to a hose leading to the water supply. The inner end of the handle terminates in a spray, and the mop is attached to a rod protruding from the center of the spray head.

FISHING TACKLE (British patent)—An ingenious tackle for the sinker and bait at the end of the fishline is illustrated by Fig. 9.

PISTON TUBES FOR PAINTS, AND THE LIKE—Figure 10 illustrates a new type of container to take the place of soft-metal tubes used as containers for artists' paints, tooth paste, and the like. With the latter, the paint or paste is forced out of the container by simply squeezing the tube, but in the new container the forcing out of the contents is accomplished by means of a piston. This piston, which is located at the base of the tube when the latter is filled, is attached to a thin metal band, which passes up through the tube and is attached to a key in the head. The turning of this key raises the piston and forces the contents of the tube upward.

ANOTHER HOUSELIKE AEROPLANE—Hardly a month goes by in which the United States Patent Office does not allow a patent on an aeroplane that looks more like a frame house of the summer-resort variety than a vehicle of the air. The aeroplane shown in Fig. 11 has such an appearance.

NONSLIPPING WRENCH (German patent)—A nonslipping wrench of a simple, yet seemingly practical design is shown in Fig. 12. This wrench will grip five sides of a six-sided nut, and it is not necessary to take it off the nut to secure a new grip, as the pivoted lip readily opens up when the wrench is moved to the right. In using the wrench to loosen or remove a nut, it is simply turned over.

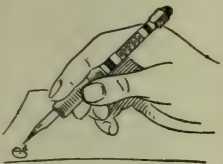
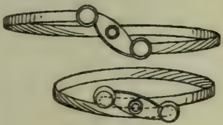


Fig. 1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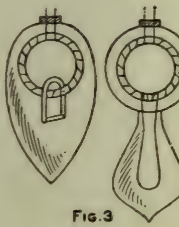
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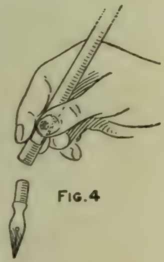
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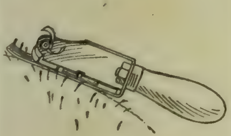
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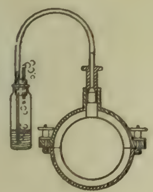
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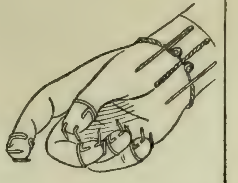
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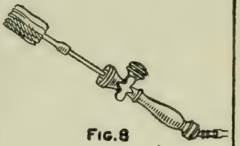
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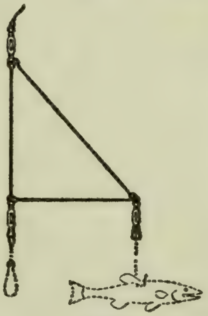
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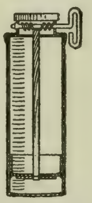


Fig. 10

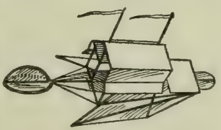


Fig. 11

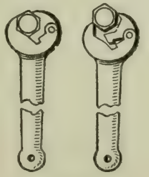


Fig. 12

A DEAR old lady had been presented with a parrot from the Congo, and she was showing it to her old gardener.

"You know, Horace, that this parrot comes from the Congo, and Congo parrots are so intelligent that they are almost human. This bird whistles 'Home, Sweet Home' so beautifully that the tears run down its beak."

"Yes, mum," quoth Horace, "I know them parrots from the Congo. I used 'ter 'ave one, and it whistled 'The Village Blacksmith' so bewtiful that sparks used ter fly from its blooming tail."

"That will do, Horace, you may go."—India Railway Gazette.

◆ ◆ ◆

"Are you the leader of this brass band?"

"No," replied the distressed man with the baton. "Every man in this band thinks he's a soloist. I'm the umpire."—Washington Star.

◆ ◆ ◆

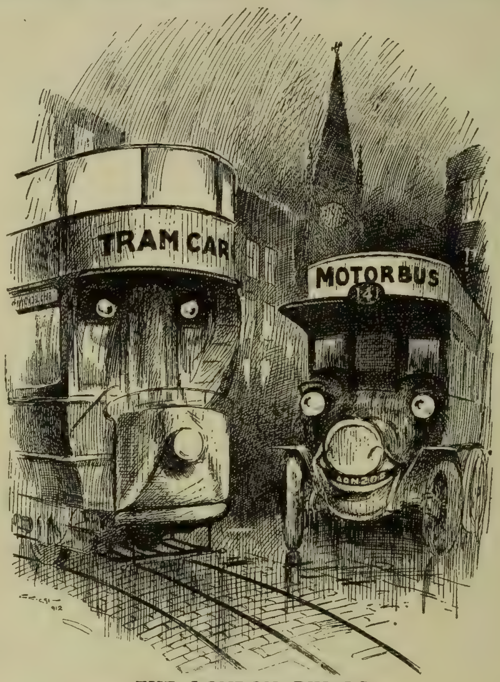
A Richmond woman has in her employ a colored cook who has managed to break nearly every article that the household contains. The mistress's patience reached its limit recently when she discovered that the dusky servitor had broken the thermometer that hung on the house porch.

"Well, well," sighed the lady of the house, in a most resigned way, "you've managed to break even the thermometer, haven't you?"

The maid replied in a tone equally resigned, "Yessum; and now we'll have to take de weather jist as it comes, won't we?"—Railroad Man.

◆ ◆ ◆

A celebrated lawyer once tried to get a Boston witness to give his idea of absent-mindedness. "Well," said the witness, who was a typical New England Yankee, "I should say that a man who thought he'd left his watch to hum, and took it out'n his pocket to see if he'd time to go hum and get it, was a leetle inclined to be absent minded."—Keystone.



THE LONDON RIVALS

Tramcar—I can carry more than you can.

Motor-Bus—Yes, but I can run anywhere, and you can't. You're tied to your rails, and you weigh six times as much as I do.—The Car

◆ ◆ ◆

Teacher—Willie, give three proofs that the world actually is round.

Willie—The book says so, you say so, and ma says so.—Harvester World.

◆ ◆ ◆

An old farmer was skeptical as to whether people who were miles apart could really talk to each other over a telephone wire. One day a near neighbor persuaded the farmer to call up his wife as a little surprise.

He put the receiver to his ear, and shouted: "Hello, Jane."

Just then a flash of lightning caused by the heat of the summer day struck the wire, and he fell sprawling to the floor. The neighbor was chagrined that the old man should meet with such an accident on his first trial of a telephone, and assured him that such a thing would not happen except in case of storms. But he would not try again. He rose to his feet, and shaking his head knowingly, said:

"It's wonderful, that was Jane, all right."—Southwestern Telephone News.

You should not lend money at 9 per cent, that is usury. Remember that God from above sees everything that we do.

Just so, my 9 looks as a 6 from above!—Le Figaro.

◆ ◆ ◆

She made him take her dust, when they
In motor cars did whiz.
But things have changed. They're wed. Today
She makes him give her his.
—Milwaukee Daily News.

◆ ◆ ◆

"My father talked me into taking this course in domestic science."

"And how do you like domestic science?"

"Well, it looks like ordinary kitchen work to me. If my suspicions are confirmed I shall drop the course and make father buy me a $50 hat."—Louisville Courier Journal.

◆ ◆ ◆

His Wife—The professor is in the laboratory conducting chemical experiments. The professor expects to go down to posterity——

(From the laboratory)—Br-r-r-r. Bang!

The Visitor—I hope that the professor hasn't gone.—Tit-Bits.

◆ ◆ ◆

A story about Signor Marconi has been floating about in stock exchange circles.

Mr. Marconi, at a dinner in Newport, was once seated beside a lady who, confusing him with his compatriot, Mascagni, said:

"Oh, I'd so love to hear you play your beautiful 'Intermezzo.'"

"I'll do it," the inventor answered promptly, "if you've got a wireless piano."—New York World.

◆ ◆ ◆

The late Thomas B. Reed, when a lad, was requested to bail out a small boat that had been leaking badly, and was almost full of water.

"I can't do it," replied Tom. "It's unconstitutional."

"What do you mean?" inquired the owner of the boat.

"The constitution of the United States says," replied the future statesman, "that 'excessive bail shall not be required' of any man."—Youth's Companion.

◆ ◆ ◆

"Say, Snibbs, let me use your phone, will you?"

"Sure. What's the matter with yours?"

"It's all right. I want to telephone to my wife that I'm going to bring a man from out of town to dinner."

"Well?"

"He's sitting in my room now, and I hate to have him watch my face when my wife tells me what she thinks of the proposition."—Telephony.

◆ ◆ ◆

"It was King Midas, wasn't it, who turned everything he touched to gold?"

"I believe so."

"Poor old fellow."

"Why do you think he was a poor old fellow?"

"He never could eat a pickle with his fingers."—Chicago Record-Herald.

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Bureau of Navigation, Box 69, Navy Department, Washington, D. C.

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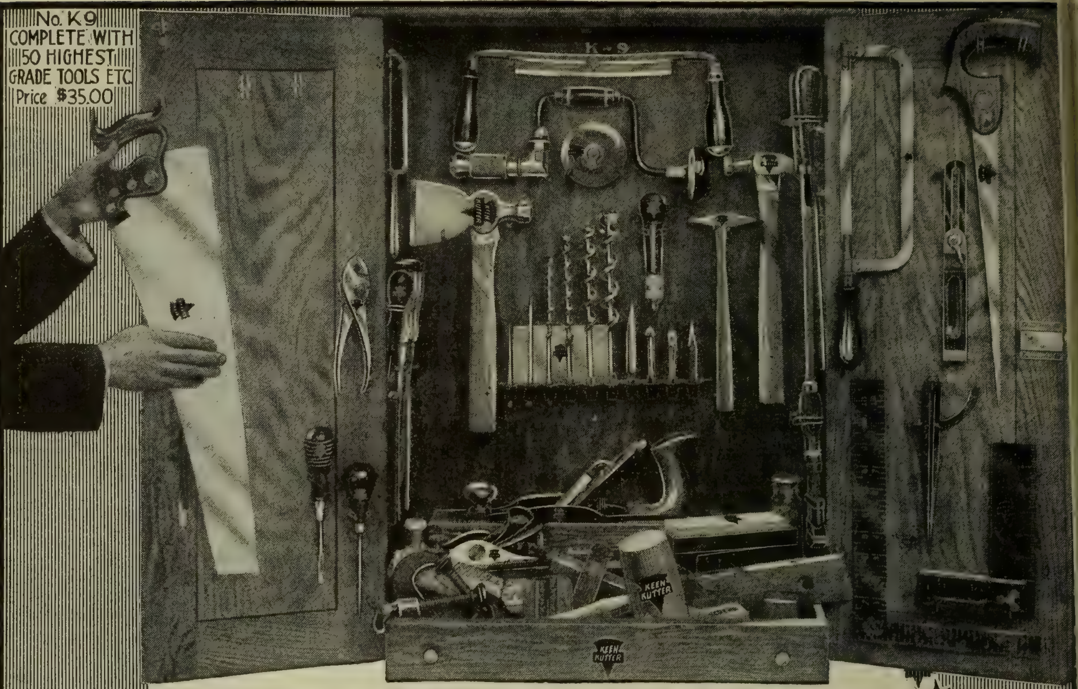

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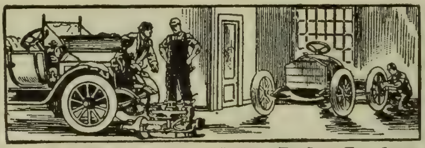

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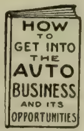

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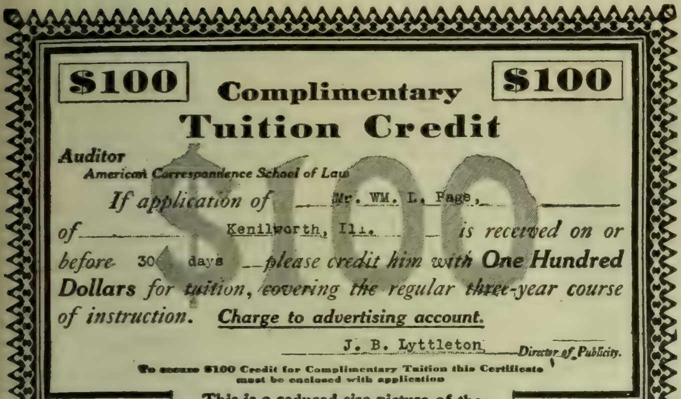

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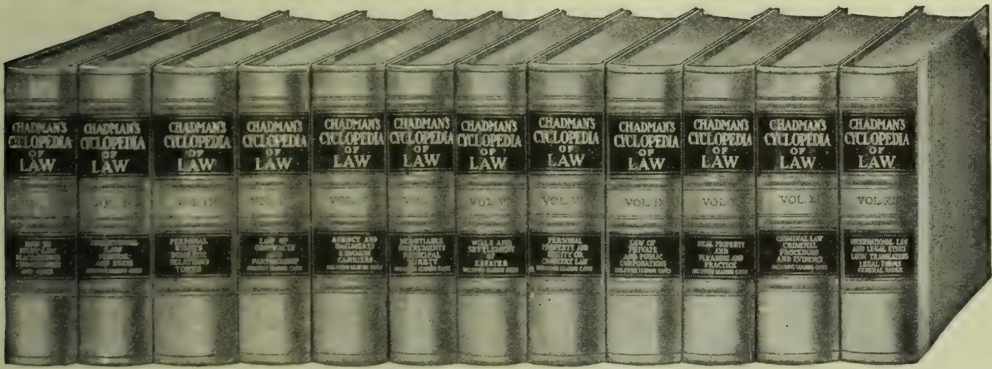

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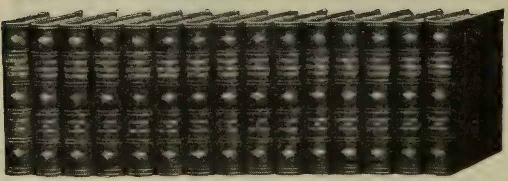

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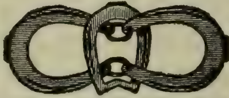

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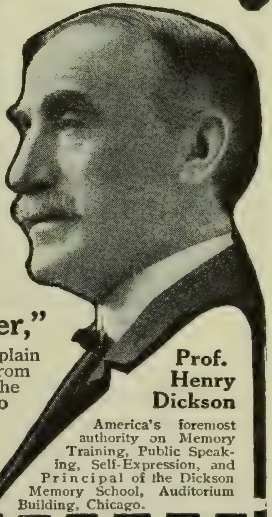

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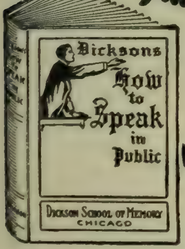

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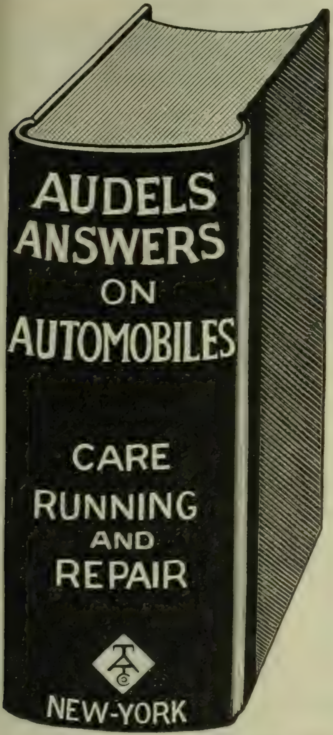

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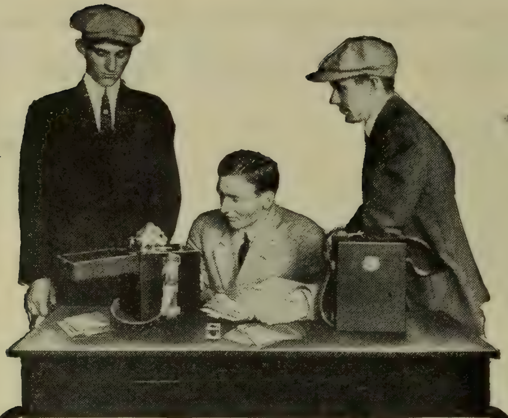

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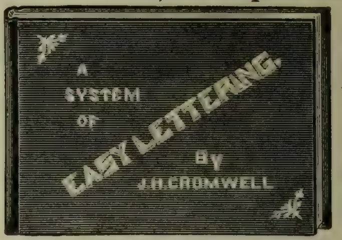

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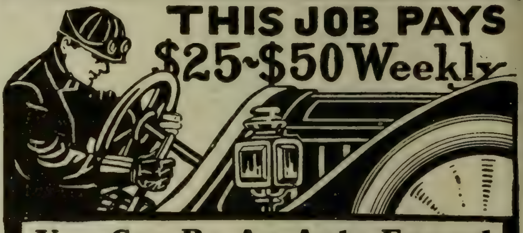

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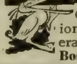

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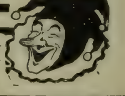

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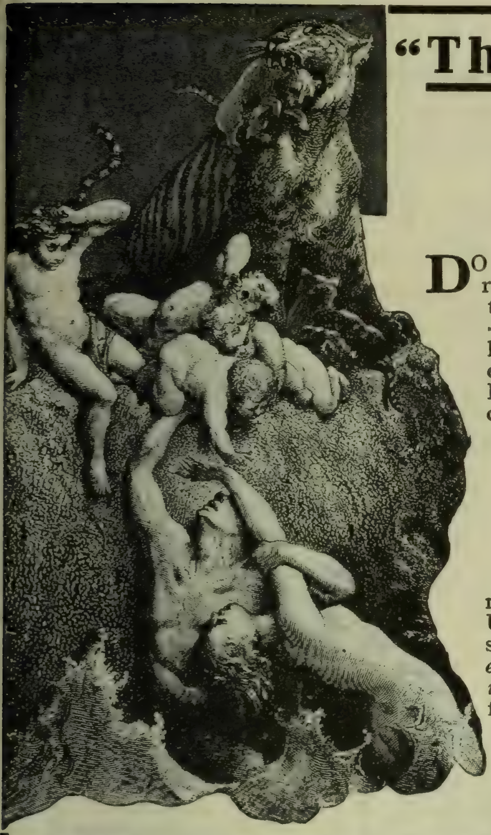

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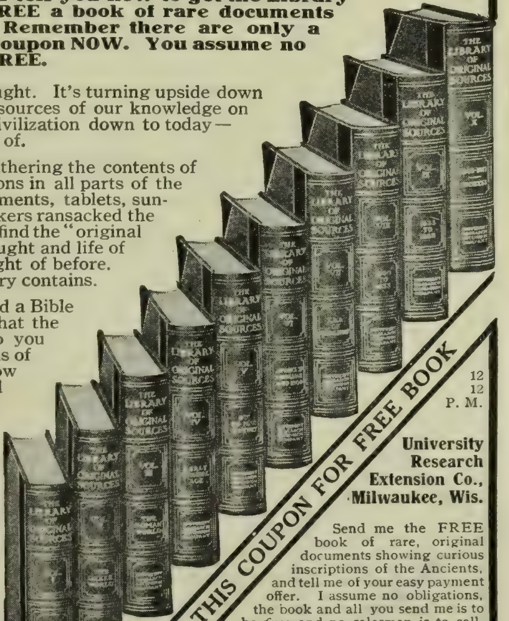
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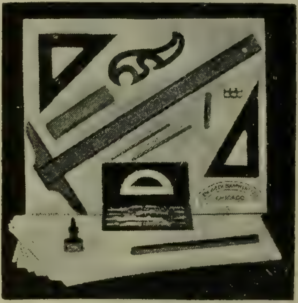

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64 VIEWS, including every state capitol in U. S., and federal buildings at Wash., D. C., mailed in folder, 15c. Nice hand colored post cards of beautiful women, 6 for 25c. Christmas Post cards, 6—10c. Circular of other post cards free. Elite Exchange, Dept. R7, 3827 No. 44th Ct., Chicago.

CALIFORNIA Wild Flowers 6 for 10c, 18 for 25c (coin). Hand painted calendars —California Redwoods 4x10 @ 75c, 6½x10 @ $1. Cooper Novelty Co., Dept. Q., Box 741, San Francisco.

25 BEAUTIFUL Xmas and New Year cards only 10c. Write for catalogue. German Am. Post Card Co., Dept. 74, Burlington, Iowa.

22 COLORED views of Niagara Falls 25c. Send for novelty catalogue. Niagara Falls Novelty Co., Box 765, Niagara Falls.

RECEIVE interesting collectors magazine membership, 10c. Globe Exchange, 433 Lexington, New Haven, Conn.

25 COLORED post cards of Boston 25 cents, postpaid. W. O. Ohlund, 44 Mountain Ave., Dorchester, Mass.

20 BEAUTIFUL assorted post cards 10c. Goldschwitz, 4052 Lake St., Chicago.

10 CHRISTMAS Post Cards and one beautiful bromide 10c. M. Tepper, 146 Marcy Ave., Brooklyn, N. Y.

JOIN Columbia Postcard Exchange, Greensburg, Ind. Members everywhere. Membership 10c.

IMPORTERS! Post Cards 12c, 17c package. Imperial Art Co., Stockport, Ohio.

"ROUND-UP" Photographs. Wonderful. Twelve $1.00. Imprimis Co., Box 382, Portland, Oregon.

JOIN Florida Correspondence Exchange. Membership 10 cts. P. O. Box 1342, Jacksonville, Fla.

SEND one dime for Four Highest Grade, Glossy, Gold Tinted Holiday Post Cards. Money refunded if not satisfied. No fake. Success Card Co., 189 Ogden Ave., Jersey City, N. J.

POST Cards. Closing out manufacturer's stock. High grade. 100 postpaid, 25c; $1.50 per thousand. Regular price, $3.50. Stanly, Cornhill, Boston.

OUR members in Norway, Switzerland and everywhere would like to exchange cards with you. Membership, 10c. International Post Card Exchange, formerly Travellers Exchange, 2917 Washington Blvd., Chicago, Ills.

JAPANESE post cards, beautiful view, rare costumes, historic, etc.; 6 for 25c. S. Otsuka, 1120 Georgia St., Los Angeles, California.

TEN beautiful gold embossed Christmas or New Years post cards for ten cents. Send trial order and be convinced of the superior quality of our high grade cards. Northern Specialty Co., 259 12th St., Brooklyn, N. Y.

SEND 10c for Samples of Colored Post Cards and Catalogue of 20,000 subjects from all over the world. Views only, Historical, Scenic, etc. No Comic. Standard Card Co., Haverhill, Mass.

READ Pictures Instead of Words—The current history of the world in cartoons. 1,200 cartoons for $1. Jan. to June, 1912, inclusive issues of Cartoons Magazine, handsomely and durably bound in book form will be sent to any address prepaid for $1. Cartoons, 318 W. Washington St., Chicago.

YOU'LL get cards from everywhere. Membership, 10c. Idaho Card Exchange, Dept. K. Box 906. Boise, Idaho.

POSTCARD collectors join our select club; membership, dime; three months, quarter. Universal Correspondence Club, Elizabeth, N. J.

YOU'LL like it! fee, 10c; list and cards mailed each member. Massachusetts Postcard Exchange, Dodge, Massachusetts.

PHOTOS. Merry Maidens—nifty poses; 10 for 25c. Duff, 2713 Mozart, Chicago.

20 ASSORTED samples High Grade Christmas Cards, 10c. M. Fitzgerald, 110 Fulton St., Brooklyn, N. Y.

EXCHANGE Postcards. World Collectors Club. 32 page booklet. Membership, 10c. World C. C., Box 8, Hartford, Ct.

9 MINIATURE, fascinating "beauty poses," catalog, 20 dandy postcards, 25c. Landsman, R-204 West 23rd, New York City.

FRENCH Art Cards; Women Studies from life Models. Samples, 10c. Complete set, 25c. Advanced Art Co., 593 Quincy St., Brooklyn, N. Y.

POSTALS. "Pretty girls;" 4 bewitching poses, 10c. 12 for 25c. Curtis Co., L-146 W. 73d St., Chicago.

FIFTY beautiful Christmas Post Cards, 25c. Worth double. Star Company, Bristol, Indiana.

PHOTOS. "Beautiful women;" 36 beauty poses, 10c. Curtis Co., J 146 W. 73d St., Chicago.

TYPEWRITERS AND SUPPLIES

TYPEWRITERS: Oliver No. 5, only $35. Guaranteed absolutely perfect. Shipped on approval. H. J. Postlewaite, Hammond, Ind.

TYPEWRITER Bargains. All makes, $10 up. Ten days free trial. Guaranteed two years. Express prepaid. Price list free. Frank Payne Company, Rosedale Branch, Kansas City, Kansas.

GENUINE typewriter bargains, no matter what make, will quote you lowest prices and easiest terms. Write for big bargain list and catalogue 17. L. J. Peabody, 278 Devonshire St., Boston.

L. C. SMITH, visible, write 2 colors, good condition, cost $100 sell for $30. Sent for free trial. Also latest model No. 5 Oliver, $30. Box 35, Oakley, Ohio.

SAVE $25 to $50 on manufacturers' prices. Buy our Factory Rebuilt Typewriters. Nearest-to-new on the market. Have trademark and guarantee, like new machines. Are thoroughly rebuilt, highly polished, and perfect in appearance. Satisfaction guaranteed. We are the largest rebuilt typewriter concern in the world. Branch stores in leading cities. Write for catalog of standard makes. American Writing Machine Co., Inc., 345 Broadway, N. Y.

NEVER buy a typewriter until you get my complete catalogue and price list of all standard makes. A. E. Atchison, 4127 West 21st St., Chicago.

BANKRUPT Sale—Greatest Sale in history of all standard makes. Guaranteed to be in good condition. Low as $10. Sent for trial, our expense. Write for catalogue No. 16. Typewriter Inspection Co., 235 W. Fourth St., Cincinnati, Ohio.

TYPEWRITERS—Every kind on the market. Write today for best bargain you ever secured. Shipped anywhere on approval, $10 up. Fletcher Typewriter Co., 207 N. 7th St., St. Louis, Mo.

BUSINESS OPPORTUNITIES

MACHINE Manufacturers' Opportunity. A serviceable, salable office device used in business and professional offices has the indorsement of, and is in constant use by such leading concerns as Swift & Company, Equitable Life Insurance Company and many others from whom we have letters of appreciation. The Patents, Parts and Good Will of this business are for sale at practically the cost of parts. The terms are reasonable. The device sells at a reasonable price. We make too many other devices to handle this one to advantage. This is a great opportunity for some live machinist or small machine manufacturing concern. The Weis Manufacturing Company, 147 Union St., Monroe, Mich.

VACUUM Cleaners. Stationary plants for houses, hotels and public buildings. The only efficient apparatus made at popular prices. Built on sound scientific principles. Has rotary power pumps. Motor can also operate other household machinery. The right man can earn big profits selling our apparatus. Responsible agents wanted. Write today. Sales Department, Koch Vacuum Machine Co., Troy, Ohio.

WANTED: A well equipped machine shop in the Middle West to take over the rights to manufacture a small engine that has proven a commercial success in Europe and will have a large demand in U. S. when introduced. We will furnish sample engine, and will finance marketing of product if desired. F. B., 1515 Marquette Bldg., Chicago.

$100 TO $500 made monthly by anyone, operating honorable, legitimate business proposition, either locally or by mail. Less than $5 capital required. Guaranteed no "fake" or "outfit plan." Address J. K. Barr, Wellsburg, New York.

FREE book filled with over 100 good formulas, to the first 20 people sending for our unexcelled formula for resilvering mirrors for 50c. A specially prepared formula that has been tried and found successful. Don't wait; get this free book. Send 50c today. Profitable Service Bureau, 4333 N. Sawyer Ave., Chicago.

AN extraordinary opportunity for party or parties with some knowledge of mechanics, not necessarily practical, with small capital. State or county rights for sale of an established patented device. Quick sale in all manufacturing districts. Exceptional profits. Address P. O. Box 489, Trenton, N. J.

WE start you in business, furnishing everything; men and women, $30 to $200 weekly operating our Original "New System Specialty Candy Factories" home or small room anywhere; no canvassing. Opportunity lifetime; valuable booklet free. W. Ragsdale Co., East Orange, N. J.

MAIL Order Business in its true light and particulars how you can obtain a loan of all advertised mail order instructions and "schemes" free, by addressing Library Dept. 5, "The Mail Order News," Fishkill, New York.

MAIL Order Men: Quick Cash Returns. We manufacture and distribute high-class specialties. Sell by mail. Small capital. Spare time. Prospectus free. Mississippi Valley Co., Inc., Box M235, Pittsburg, Kansas.

BIG profits for you: Manufacture Barley Crisp. New confection. California invention. 5c packages costs you 1c. Machine, instructions complete, $7.50 prepaid. Samples, 10c. Barley Crisp Co., 1605 Hyde St., San Francisco.

"THE Art and Process of Dry Cleaning." A fascinating and profitable occupation. 25 cents postpaid. Auburn Supply Co., Dept. EE, 7746 Peoria St., Chicago.

BE your own boss. Start mail order business. We teach you. 20 years established. Everything furnished. "Starter" free. Krueger Co., Dept. 2B, 167 W. Washington, Chicago.

$ DOLLAR $ getting $ secrets. $ Send 10 cents now for six valuable Trade Builders. Start a profitable business of your own and make more money. Satisfaction guaranteed or dime refunded. G. Edward Harrison, Baltimore, Md.

EARN $1.80 on every $2 order in the Silver Plating Business. Make your spare time net $$$. My pamphlet shows you how; write for it today. Milligan Co., Dept. 21, Davenport, Iowa.

SAFETY Elevator (Patented) Manufacturers investigate. Accidents entirely eliminated. Roussel, 1101 Diamond Bank Building, Pittsburgh, Pa.

MAIL-Order Firms. Commission circulars that insure $20 on every thousand mailed. Books, catalogs, etc., with your imprint. Samples, 12c. Successful plan free. Popular Institute, 502 West 69th St., Chicago.

YOU can make $10 daily restoring colors to faded rugs and carpets in spare time; tremendous opportunity in your community; simple, easy. Free particulars. Coxe, Dept. MB, Omaha, Neb.

GET rich manufacturing ink, new process, full instructions and factory equipment. Parcels Post makes millions of customers; small capital needed. Box 128, Hawesville, Ky.

BUSINESS Wanted—Am looking for a good opening. Will buy whole or part. Good references and full description. Address Business Man, Box 1308, Cherry Valley, Illinois.

MAKE money down cellar this winter. One man is doing it—so can you. No mushroom chestnut; new scheme you never heard of. "Back Lots Schemes" explains this and many more. Write for circular. Metz, Box M-87, Times Square station, N. Y.

MONEY in Minerals. Asbestos, Feldspar, Corundum, and many other minerals have money value and ready market. Minerals identified free. Assays and Chemical analyses. Mineralogist, Box 155, Carterville, Mo.

MEN and Women—Earn $1.80 on each $2 order, replating silverware. Make your spare time net dollars. Free descriptive booklet. Union Sales Company, Riverside, California.

YOUR classified ad can be placed in 1,000,000 small town homes at low cost every week. Ask for free Result Checking Book, Classified Dept., Boyce's Weeklies, 500 Dearborn Ave., Chicago, Ill.

GREAT success. Start a formula business. Make $2-300 a month. Just off the press. Our new collection of rare, valuable European formulas. Particulars free. Becker Comp., M 5325 Bishop, Chicago.

MAIL Order Men—Agents—Salesmen—The "Balritt Selling System" will positively triple your sales. Complete plan prepaid 60c. Balritt Importing Co., 158 Lawrence St., Brooklyn, N. Y.

OPERATE Hahn's Premium Machines. Let them gather pennies for you. The best seller for cigars and candies. J. L. Hahn, 1016 Germantown Ave., Philadelphia, Pa.

BIG Money manufacturing candy, pop corn goods, ice cream and soft drinks. Complete directions and formulas 25c. U. S. Specialty Co., Desk 9, New Philadelphia, Ohio.

KENTON, Ohio, Commercial Club is seeking industries. Will co-operate in the organization and sale of stock of new companies. Harry Hopwood, secretary.

TRIAL Offer: $1.00 places your 25 word ad in 200 magazines; regular price 6c per word. Kings Magazine, Box 13 P., Little Silver, N. J.

YOUR 25-word ad placed in 100 good monthly magazines for only $1. Write me before placing any advertising. I'll save you money. F. L. Miller, Drawer 14-P, Syracuse, N. Y.

SHEET Bluing, Mending Tissue, Gold Eyed Needles, for Trust plan and Mail Order Dealers. Sample 10c. Frank Shilling Co., Navarre, Ohio.

BIG Money in the Mail Order Business. Experience unnecessary. Small capital. Instructions free. Keith, 719 Central Bldg., Rochester, N. Y.

PLEASANT Spare Time work, mailing circulars. Good pay. No scheme. Instructions free. Home Pub. Society, 1217 Market St., Philadelphia, Pa.

LEARN Silver Plating at home. Big money. Particulars free. Address Mr. Baily, Lock Box 123, New Bedford, Ill.

MAIL Order Business. Send 25c for four plans and you're started. E. Dunne, 7631 Sangamon St., Chicago.

INDEPENDENCE for life offered stockholders. American Ginseng Co. Book Free, 2649 Wabansia Ave., Chicago.

START in the Mail Order Book business—small capital only required but the profits are large and possibilities unlimited! Our $1 book, "500 Things Worth Knowing," is the best seller in the world—it will make Big Money for you! Send 25c for sample copy and terms or write for our literature; it's free. Wm. Rea Publishing Co., Northwestern Building, Chicago.

144 PENCILS with your four line ad, only $1.90 prepaid. Crescent Pencil Co., Thibodaux, La.

DOLLARS made distributing advertising matter. Particulars free. Pulver Bros., Allen St., Hudson, N. Y.

BE a Mirror Expert. $3-$10 day; spare time home at first; no capital; we train, start you making and silvering mirrors; French method. Free prospectus. W. P. Derr, Pres., 87 Saratoga Ave., Brooklyn, New York.

WHY not increase your profits by handling fast selling specialties we manufacture. Mail order men and general agents, write today. Crescent Mfg. Co., Erie, Pa.

$1.50 SELF Filling Fountain Pen for 15c. Each in box with directions for use, and "Price $1.50" printed on box. High grade appearance. In Dozen lots, 15 cents each. Special price in Gross lots. If you have a Mail-Order ambition, send 25 cents for sample—it will lead to other price revelations. Money back if you do not think it worth at least $1. Manufacturers Distributing Company, Pittsfield, Mass.

THE Parcels Post and the Mail Order Business. Want to start something? An agent? Want to make more? Our magazine will show you. Trial three months, 10c. Single copy, 5c. The "Lever" Mail Trader, 44, Elizabeth, N. J.

"SUCCESSFUL Brains"—My Mail Order book that I want you to handle—it's the best one on earth—millions of copies should be sold on merits alone—fortunes should be made by those who heed its teaching! Write me and I will make it to your advantage to sell this, my newest and best book, by furnishing you circulars and books at the right figure. May I send you confidential Mail Dealers' prices? Weissgerber, Northwestern Building, Chicago.

A CHICAGO Office would boom your business and greatly increase your prestige. Our service will delight you; particulars for stamp. The Model System, 538 S. Dearborn St., Chicago.

BIG profit in Metal Polish. The best can be made for about 50 cents a gallon. Send 10 cents and I will send formula and material to make one-half pint. H. L. Rogers, Beach Street, Wollaston, Mass.

SACHET Powder in bulk; also envelopes for premium purposes; samples and selling plan, 10c. Cadby Co., 77 Woodward, Providence, R. I.

BE Independent. Get my four big money making formulas, tells how, 10c. Hab Co., Dennison St., Highland Park, New Brunswick, N. J.

GUARANTEED Remington typewriter free with $1 monthly Typewriting Course. Merit Service, Oshkosh, Wis.

SELL your formulas, ideas, plans and knowledge by mail. Some make $1,000 monthly. Instructive booklet for stamp. Information System, 280, Marietta, Ohio.

MEN, Women, Boys and Girls, don't be without Christmas money. Send twenty cents in silver for my honest ligitimate money making plans and formulas. Chance for steady business. Standard Supply Co., 2331 N. Lawndale Ave., Chicago.

LEARN to Metalize! Make exquisite and beautiful jewelry of roses, butterflies, etc. Pleasant, profitable employment. Stamp brings sample and particulars. P. Benson, Stewartville, Minn.

BIG Profits: Open a dyeing and cleaning establishment, splendid field, little capital needed. We teach by mail. Write for booklet. Ben-Vonde System, Dept. C, Charlotte, N. C.

WE furnish mail order dealers with protected specialties for establishing clean, forceful, high-profit mail order enterprise. Special service, based on advanced business principles. Full details free. Bixby Publishing Co., Box W 134, Buffalo, N. Y.

BEFORE Taking Any Chances in the Mail Order Business, invest 10c for two samples of "Booster"—the one bonafide Mail Order publication on earth—a magazine that has made money for others and will show you how! Send 10c today—it's worth many dollars to you. Booster Magazine, Northwestern Building, Chicago.

HERE'S your chance for a legitimate and profit producing mail order proposition; a business as clean and dignified as you can put your name to. $10 and less starts it, and a postal card with your address brings free proof without any obligations. Address Expert, 420 Home Bank, Baltimore, Md.

BUSINESS opportunities for you—with money making methods in Digest. You can make $$$. One year subscription only, 25c. Digest, Grand Rapids, Mich.

$3,000 A YEAR and Freedom! Stop slaving. Quit unprofitable grinding. Learn Show Card Writing and establish yourself in your own locality without invesment or expense. Be your own boss. Study in spare time. Easy, simple instructions. A Money Making profession for life. Our complete $30 course, now $5. Write quick for free pamphlets. L. Hitpas, 114 Adams St., Peoria, Ill.

I'LL send you, prepaid, several winning Business Plans. If accepted pay me $2; otherwise return. Include 8c mailing cost. D. Baur, 212 West 114th Street, New York.

WHAT? in Exchange for advertising in 100 magazines. Wilson's World, 3505 Evanston Ave., Chicago.

WE Help Raise Capital at once to start you in retail—manufacturing—patent—real estate—mail order or any legitimate business by means of "Our Practical Method." Particulars free. The Business Aid Co., K504, Detroit, Mich.

BE Independent. Start Money Making Mail Order Business at Home. New Plans. Everything furnished. Only small capital required. Free booklet and particulars tell how. W. P. Miller Co., Box 254, Muskegon, Mich.

I WILL start you earning $4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 306, Boston, Mass.

MANUFACTURE Gold Letters for signs—$100 per month easy. I start you. Experience unnecessary. Take like wildfire. Prospectus free. J. F. McPherson, 673 Brown Avenue, Butler, Pa.

PROFITABLE home business. All or spare time. No mail order scheme. No outfit to buy. Particulars free. P. Akorn, Rosebank, New York.

START a credit reporting office, every merchant needs and will pay for this service. You can make money. Field new and white for the harvest. No capital required. Ask for booklet. Free. National Protective Service, Uhrichsville, Ohio.

INCORPORATE free; pay expenses; we take stock for services. Listed Securities Co., Elmira, N. Y.

WE start you in a permanent business with us and furnish everything. We have new easy selling plans and seasonable leaders in the Mail Order line to keep the factories busy. No canvassing. Small capital. Large profits. Spare time only required. Personal assistance. Write today for (copyrighted) plans, positive proof and sworn statements. J. M. Pease Mfg. Co., 541 Pease Bldg., Main St., Buffalo, New York.

FORMULAS furnished by expert chemists, for manufacturing Toilet, Household, and Technical products. Government serial numbers obtained. Catalogue for stamp. B. Mystic Company, Washington, D. C.

YOUR Brain can make $200 while your muscles make fifty cents. Write for proposition. Dunning, Aulander, N. C.

EARN $7 to $12 daily, restoring faded colors in rugs and carpets, whole or spare time. No capital. Free Booklet, tells how. Wm. A. Eldred, Dept. 75, Detroit, Mich.

MAIL order ads that pay. 20 different propositions fully explained. All bona fide, sure-fire Money-getters. Each one the foundation of a successful Mail Order business. Send 10c for full particulars and regular bulletin of new propositions. Mail Dealers Wholesale House, 450 Franklin Bldg., Chicago, Ill.

$1 A WEEK will start you in a big money-making mail order business—with the best line—in spare time. Particulars free. Nadico Company, 1664 Belmont Ave., Chicago.

A Bit Shy on Salary? I pick up $1,500 yearly additional from newspaper correspondence. My book tells what's news, how to get it, where to sell. Newspaper directory included. No correspondence school expense; only 50 cents. Morris White, Station, 50, Detroit, Mich.

INCORPORATE your business under Arizona laws. Cost small. No franchise tax. Stockholders exempt from corporate debts. Do business anywhere. Laws and forms free. Southwestern Securities & Investment Company, Box D488, Phoenix, Arizona.

PATENTS secured—C. L. Parker, 910 G St., Washington, D. C.

AN intelligent person may earn $100 monthly corresponding for newspapers. No canvassing. Send for particulars. Press Syndicate, 700 Lockport, N. Y.

I MADE $50,000 in five years with a small mail order business; began with $5. Send for free booklet. Tells how. Heacock, 5074 Lockport, N. Y.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies. Desk C. R., Omaha, Neb.

FORM a corporation—Congress Law for D. C. and all States; cheap. Raise money easily. U. S. Legal Corporation, Washington, D. C. Representing $1,225,000,000.

COLLECT money by a sure, simple, system. Income $1,000 to $5,000 a year. Quick results. No capital required. Instructive book, "Skillful Collecting," free. National Collectors Ass'n., Long Street, Newark, Ohio.

HAVE you anything to advertise? Our Rate Book tells you all about advertising mediums, rates, circulation, closing dates, etc. Sent for 10c. Worth dollars. Folder free. Correspondence invited. Dearborn Advertising Agency, 455 Franklin Bldg., Chicago.

PATENTABLE ideas wanted—Send for 3 free books. Richard B. Owen, 30 Owen Bldg., Washington, D. C.

FOR ADVERTISERS

RETAILERS, Mail Order Dealers, Wholesalers, Jobbers, I can increase your profits by doubling the efficiency of your sales literature. Tenth year. Form letters, circulars, advertisements, prepared or rewritten at $5 each, and worth it. Results guaranteed. Send me full information. M. A. Stern, Monticello, N. Y.

"THE Ad Writers' Assistant"—Book containing 350 phrases, headlines, suggestions, interesting opening chapters, each illustrated with apppropriate cut, mailed, 25c. Cuts supplied. F. S. Ailes, Drexel Building, Philadelphia, Pa.

ADVERTISING Assistance. Original advertising matter devised and prepared ready for printer or publisher. We invite correspondence. C. C. Taber & Staff, suite P, Post-Standard Bldg., Syracuse, N. Y.

BARGAIN Advertising Rate—Just to get acquainted—15 words, one insertion; guaranteed 10,000 copies, printed, and one years' subscription, 25c. Digest, Grand Rapids, Mich.

AGENTS WANTED

SPECIAL Sales Manager wanted in your town right away. Plenty of money for you to spend. Hottest tailoring offer ever made. Orders turned over to you. Make $50 a week at the start. Only part of your time. Your nobby free suit will attract so much attention that orders will simply roll in. Every order means dollars to you. Other good features. Paragon suits sell like wildfire. We prepay all express charges, too. Now is the time to get in. Be the first in your town to get this great offer. An opportunity to make the biggest success ever. Send post card with your name and address for our book of beautiful samples and full particulars. All free, so write at once. Paragon Tailoring Co., Dept. 1199, Chicago, Ill.

SOMETHING New! We are now prepared to quote prices on our new Electric Toaster. Retails $2.75. Other makes, $4 to $8. Guaranteed. Be the first to get the cream. Demand already created. County Agents—Sales Companies! Send $2 for sample. Test it. Money back if dissatisfied. Wilson B. Wickersham Mfg. Co., 538 South Clark Street, Chicago.

CHANDELIER Clothes Dryer—Pulls up to ceiling on porch or in house. Clothes out of way. Holds good size washing or ironing; weighs three pounds; sent prepaid, $1.50. Every home will buy one. Agents wanted—Auburn Supply Co., Dept. DD, 7746, Peoria St., Chicago.

FREE, swell suits to wear—plenty of money to spend as our special manager in your town. Make $40 a week easy. Suits sell like hot cakes. Your own free suit will get scads of orders from your friends. Only part of your time. No money nor experience necessary. All orders we take in your section turned over to you. This is a most stupendous opportunity for one man in each town. Get in Quick! We pay express on everything. Send a post card with your name and address for beautiful samples and full particulars, all free. Entirely new plan. Chance of a lifetime. Don't miss it. No obligations. Hurry! Write today. American Woolen Mills Co., Dept. 1199, Chicago, Ill.

PLEASANT home work; no canvassing or collecting to do! Earn $50 a month in your spare time. All our work may be done in any room of the house without even your nearest neighbor knowing you work for us, if you so desire. Write today! Wilbert F. Blye & Co., Dept. 31, Terre Haute, Ind.

AGENTS are coining money selling our big 10c packages of 20 Assorted Holiday Postal Cards. "5,000 Varieties." "Big Profits." Sell everywhere at sight. Sample package, 10c. Particulars free. Sullivan Card Co., 1238 Van Buren St., Chicago, Ill.

AGENTS—Would you like a steady position at $30 a week to start and a chance to be promoted to district manager at $3,000 yearly? No experience required. My agents have steady work all the year. I need more agents quick. This fine position is open to you if you will write me personally at once. E. M. Davis, President, Davis Co., 264 Davis Bldg., Chicago.

AGENTS—Be quick—get the agency—never such a seller—make $100 a week—Model Vacuum Cleaner—carpet sweeper type—wonderful suction—Sells for $8.50—your profit over 100 percent—no competition—patented—we start you—the Cleaner sells itself—free sample to workers. Model Vacuum Co., "D 20," Cincinnati, O.

YOUNG man, would you accept and wear a fine tailor made suit just for showing it to your friends? Or a Slip-on Raincoat Free? Could you use $5 a day for a little spare time? Perhaps we can offer you a steady job. Write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Company, Dept. 924, Chicago.

SALESMEN are making big money taking Xmas orders for tailored to measure, classy Raincoats. Better fabrics; half store prices. Sample coat to reliable agents. English Raincoat Tailors, Ltd., New York.

BIG profits for you! Manufacture Barley Crisp. New confection. California invention. 5c package costs you 1c. Machine instructions complete, $7.50 prepaid. Samples, 10c. Barley Crisp Co., 1615 Hyde St., San Francisco.

RESILVER mirrors and make plenty of money. Full instructions, 50 cents. Auburn Supply Co., Dept. CC, 7746 Peoria St., Chicago.

AGENTS can sell Sun-Ray Incandescent Kerosene Mantle Burners to everybody using lamps. Will sell on sight. New 1912 model 100 candlepower. Fits all lamps. Ten times brighter than gas. Write for catalog. Free particulars. Simplex Gaslight Co., Dept. M, New York.

AGENTS—Our New Steel Mantle Burners fastest sellers on market; fit all lamps; convert kerosene into gas. Smokeless, odorless. Guaranteed perfect white light. Sample burner postpaid, 25c. Lyndhurst Burner Co., Dept. P, Lyndhurst, N. J.

BROKERS and general agents to handle "Klenene;" protected territory. Klenene Products Co., 1581 So. Pearl St., Denver, Colo.

AGENTS wanted everywhere to sell our highly endorsed automobile, motorcycle and motorboat accessory; big commission, exclusive territory granted. National Sales Co., Milk St., Boston, Mass.

AGENTS makes $30 weekly, experience unnecessary, particulars free. Pals Manufacturing Company, A25 East 14th Street, N. Y. City.

AGENTS wanted to introduce and sell Great Fun-making Game, also Bill Collector Letter-forms for merchants. Send for Agent's Prices. Inland Mfg. Co., Topeka, Kans.

YOU can make $10 daily restoring colors to faded rugs and carpets in spare time; tremendous opportunity in your community; simple; easy. Free particulars. Coxe, Dept. MB, Omaha, Neb.

AGENTS—Carpet sweeper, vacuum cleaner, low, substantial; child can handle; good profit. H. Bouma, 128 Packard St., Grand Rapids, Mich.

$1,000 EARNED by three people within thirty days selling our Fire Extinguishers. Buyers everywhere; protected territory; 500% profit. Local and State Agents wanted. United Manufacturing Company, 1242 Jefferson, Toledo, Ohio.

PORTRAIT Agents—If you want better portraits for less money, try me. I guarantee satisfaction. Twenty years experience. L. T. Kunde, Artist, 53 Cawker Building, Milwaukee, Wis.

LADIES—To solicit orders for toilet articles. Big pay and success is sure by our plan. F. H. Young & Co., Toledo, Ohio.

AGENTS — Something live — something fresh—something new. Something that's a seller, and bringing our boys $35 a week and up. National Manufacturing Co., Lemont, Ill.

LOVELY Sachet Powders made from California's sweetest flowers; package postpaid, 10c silver; agents wanted. Tropical Perfume Co. A322 S. Spring, Los Angeles, Calif.

WE want resident agents, spare or full time, to represent us in the sale of our carbon paper and typewriter ribbons; experience unnecessary. Diamond Ribbon & Carbon Co., 37 Liberty Street, New York.

WANTED—Agents. An automobile necessity. Sells easily and quickly. Big profit on each sale. For particulars, write Oakland Merchandising Co., H., 109 Oakland Ave., Pontiac, Mich.

GENERAL Agents. Most practical and greatest quarter specialty ever invented. Newly patented. Necessity everywhere. Fortune awaits salesmen. Columbia Mnfg. Co., 1557 Wells St., Chicago.

MAIL Order Men: Quick cash returns. We manufacture and distribute high-class specialties. Sell by mail. Small capital. Spare time. Prospectus free. Mississippi Valley Co., Inc., Box N235, Pittsburg, Kansas.

MEN wanted to act as District Managers; I have a new proposition to get hundreds of men to canvass for you; if you are looking for a position, write A. E. Altvater, 112 W. Mulberry St., Baltimore, Md.

SOAP Agents. Our Vegetable Soap, Toilet Article and Remedies Excel and Outsell. Sample free. Buchanan & Co., 54 So. Main St., St. Louis, Mo.

FOR sale, one agents country medical or merchants wagon, waterproof, door compartments. Inland Mfg. Co., Topeka, Kans.

AGENTS in every town. Best selling Household Article. Start at once. Large demand for goods. $25 to $50 a week. Success assured. Investigate today. Main Specialty Co., Dept. H., Williamsport, Penna.

AGENTS—Big profits in selling the new E-Z Gas Irons. Have many new features; sell on sight; speaks for itself. Territory going fast; don't miss this opportunity. Write now for full particulars. Dept. B, Enterprise Tool & Metal Works, Chicago, Illinois.

AGENTS—Write today for our big proposition. It's free. You can easily make big money with it. The Miller Supply Co., Cleveland, Tenn.

YOUR 25-word ad placed in 100 good monthly magazines for only $1. Write me before placing any advertising. I'll save you money. F. L. Miller, Drawer 14-P, Syracuse, N. Y.

AGENTS—Get acquainted with our proposition. Pleasant work and orders in every house. Address A. G. K., 1642 W. Division Street, Chicago.

AGENTS—Some agents made $500 last Christmas to sell beautiful refined Japanese calendars. Are very rare and best for Christmas present. 100 for $10 and $25. Otsuka, 1120 Georgia St., Los Angeles, Calif.

NO free samples. Article requires none. Used by everybody. Agents frequent repeat orders. Dempsey Mfg. Co., Dept. C, Fitchburg, Mass.

CLEAR $10.20 daily, with our new proposition. Failure impossible. Particulars free. Princess Perfume Co., 304 Northampton St., Buffalo, N. Y.

AGENTS make 500% profit selling our gold window letters, novelty signs and changeable signs. 800 varieties in enormous demand. Catalogue free. Sullivan Co., 1238 Van Buren St., Chicago, Ill.

AGENTS—Now is the best time to make big money selling our new fully guaranteed goods. Everybody buys at sight. Live agents selling nothing else. Write immediately for our $5 to $10 per day proposition. A Postal will do. Best Mfg. Co., 851 Broad Street, Providence, R. I.

"IZ-BEST" Hosiery, 40 styles, gives best wear. Free book tells how to develop permanent, profitable business, selling direct to wearer; all or spare time; either sex. Colby Hosiery Co., 2nd & Diamond St., Phila., Pa.

MANUFACTURER of popular brand linen heel and toe guaranteed hosiery wants agents to sell direct to consumers. Pechman earned $136.20 in five days. Exclusive territory. Credit. Send for particulars. N. Parker Mills, 720 Chestnut St., Phila., Pa.

"AGENTS Wanted" advertisers are most successful and enthusiastic users of advertising space in Boyce's Weeklies. The 1,000,000 circulation pays big. Write for free Result Checking Book. 500 Dearborn Ave., Chicago, Ill.

AGENTS—Mail Order Men. Your 25 word ad in 100 Magazines, $1. Box 22, Station B. Worcester, Mass. The Williams Specialty Co.

AGENTS—Ask us about our snappy household specialty line which will clear you $50 to $80 weekly. American Aluminum Co., Div. 7, Lemont, Ill.

AGENTS—Get particulars of one of the best paying propositions ever put on the market. Something no one else sells. Can make $4,000 yearly. E. M. Feltman, Sales Manager, 6124 Sycamore St., Cincinnati, O.

A WONDERFULLY profitable business quickly established in your own community placing year wear sight selling dress shoes for men and women from our factory to wearers. No risk. Kushion Komfort Shoe Mfr., Lynn, Mass.

AGENTS—One cent invested in a postal card will bring you a $35 to $60 a week proposition. Sterling Aluminum Co., Station "U," Chicago, Ill.

ATTRACTIVE proposition to live men and women agents for beautiful leather novelties. Particulars free. Handsome sample, 25c. Pullen Brothers Co., Box 809, Providence, R. I.

SOMETHING unusually "alive" for you in "wide-awake" agency proposition. This space too small for details. Write "Armacost," Thurmont, Maryland.

QUICK selling Vacuum Cleaner, powerful sweeper type. Free sample to hustlers. Make big money employing sub-agents. Experience unnecessary. Vacm Co., 1488 Security Bldg., Chicago.

TEN Dollars daily made with us. Free 50c sample also Dollar Daily Guarantee with first order. Dollar starts you; fifteen cents for mailing free sample. Particulars for stamp. M. Brodrick Green Company, Findlay, Ohio.

AGENTS get busy selling our new pancake griddles that bake six cakes per minute. Also our shoe cleaners. Samples $1. Act quickly. Other good sellers. Logan Mfg. Co., 2313 Pleasant Place, Chicago, Ill.

FORMULAS—3000 FORMULAS and Digest Publishing 100 formulas, etc., monthly. One year 50c or Silvering Formulas and Digest one year 25c—or 200 Formulas and Digest one year, 25c. Digest, Grand Rapids, Mich.

READ the Agents Magazine. 2 months, 10c. Yearly, 50c. Agents Magazine, Chicago.

HOLIDAY Show Cards—Every Merchant buys on sight. 1000% profit. Samples, 10c. Folders free. Merchants Specialty House, 550 Franklin Building, Chicago.

AGENTS—Salesmen. Seasonable seller, latest $3.50 electric invention fills demand never before supplied; home, office, store, everywhere eagerly sought. Repeat orders outnumber first sales, you control territory, no competition, unlimited possibilities. Write Frank W. Alden, Agency Manager, 149 Station F. Cincinnati, Ohio.

THE Christmas rush is on. Agents can now make enormous earnings selling our high-grade guaranteed jewelry at one-third less than regular retail prices. Write quick for particulars to Dept. B 4, Consumer's Direct Supply Co., Boston, Mass.

AGENTS—Live wire proposition offered to hustlers; exclusive territory on profitable new article; fast seller to men. Write quick. Schiller Mfg. Co., 1124B Foster Ave., Chicago, Ill.

AGENTS—Cost 2c, sell 25c. Sign letters put on with roller. Samples free. Embossed Letter Co., 230 W. Illinois St., Chicago.

WHERE did your money go? Find out. Begin the New Year with our Daily Expense Record. It will keep you posted and reduce expenses. A very interesting and complete book—50c. Agents wanted. Auburn Supply Co., Dept. HH, 7746 Peoria St., Chicago.

INTERNATIONAL opportunity to become manufacturer, during spare time. Canvassing unnecessary. 700% profit. Complete course and years coaching, $2. 10c brings sample and particulars. Act quick. Delzell Manufacturing Company, 448 South Mathews, Los Angeles, California.

WANTED—Agents to carry "The Index Visible Memo-File," a clever time-saving appliance with 100 uses in offices, factories, homes. New and only device of its kind. Rapid seller—big profit. 75c retail. Index Visible Company, New Haven, Conn.

IT takes something new and original to make big money. Something with no competition. We can show you how to obtain a handsome steady income, no experience necessary, no canvassing. Why not you receive this income; write for particulars today. Enclosing 4c postage, this offer limited. Be one of the lucky ones, address H. Builder, Room 504, 35 So. Dearborn St., Chicago, Ill.

LEARN the truth about Mail Order Business before buying outfits. Valuable information and particulars free. Mail Order Library, P, Tompkinsville, New York.

STUDENTS Teachers: Something especially for you. Spare time, no canvassing. Write for further information. Ray Kuns, 773 Summit Avenue, Cincinnati, Ohio.

EASY selling meritorious goods for agents and mail order dealers. Particulars free. Post Supply Company, Waltham, Mass.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal protfis; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for $3.50 and saves the purchaser an investment of $25; write for particulars. The Handy Light Co., 113 Handy Light Block, Cincinnati, Ohio.

A SPECIAL specialty. Our siphon takes cream from bottled milk. Sample and particulars, 25 cents. Siphon Specialty Co., Syracuse, N. Y.

CASH for names, addresses, information, etc. Steady income at home. Instructive booklet for stamp. Information System, 281 Marietta, Ohio.

PORTRAIT agents find our plan beats all others. Prompt shipments—rejects credited. 30 days' Credit. Catalogue of Portraits, Frames, Pillow Tops, Sheet Pictures and samples free. James C. Bailey & Co., Desk R-7, Chicago.

AGENTS—Make $2 each selling our wonderful luminous crucifixes; nothing to sell six a day; absolutely new; shine all night in darkest room. Pioneer Portrait Co., 1259 W. 63rd St., Chicago.

MANUFACTURER wants traveling or local salesmen on commission. Universal Case Register, 608 15th, Detroit, Michigan.

SEE our ad for Agents. Embossed Letter Co., Chicago.

WANTED—Agents everywhere to sell our new household and office specialties. Big profits. Easy sales. Particulars free. Bare Supply Co., Dept. 10, Golden Gate, Ill.

AGENTS—Sell the handy light, big profits. Experience unnecessary. Seasonable seller. Convenient to carry. Best up-to-date proposition for Manufacturer's Agent. Handy Lights guaranteed. We give Credit. The Handy Light Co., 185 Handy Light Block, Cincinnati, Ohio.

WHY pay "Trust" prices for Fountain Pens? I will send you 3 of my popular gift pens postpaid for one dollar. Henry Dines, Brattleboro, Vt.

AGENTS—$200 monthly distributing Newells needle cases. Sell 115 needles in book for 10c and make 200% profit. Approval Plan envelopes make talking unnecessary. Crew Managers write. Send 10c for sample book and particulars. Newell Company, 5600 Delmar, St. Louis, Mo.

AGENTS—Best and cheapest Pat. Pocket Cigar and Gas Stove Lighter, retail 25c; 150% profit. Manufacturer Berthold, Flushing, L. I.

GET an Elegant Suit and make $10 a day, acting as our representative in your town. Wear the swellest suit your town ever saw—made to your exact measure, from your choice of cloth and styles. It need not cost you a dollar. Make $10 a day showing your suit—taking orders for elegant Made-to-Measure Suits, delivered express paid for $7.50 and up. We are spending a big sum to secure and assist a representative in every town. We make prices so low—your profits so big—confidential terms so liberal—that we can explain these only in a letter. No money or experience required. We want your spare time—not your money. We back you with our capital—teach you everything—give you the Big Outfit Free. Do you want the Exclusive Agency in your town? Then write quick and get the whole proposition, outfit and everything—absolutely free. Chicago Woolen Mills Co., 834 Jackson St., Chicago.

YOU sell our Auto Tire Repair Kit for $2 and make $1 on every sale. Mends punctures and blow-outs instantly. Agents wanted. Write The Useful Co., 500 Fifth Ave., N. Y.

AGENTS—Guaranteed Shoes, "must give satisfaction" or new pair free. All styles. Fit guaranteed. 98c profit on every sale. Quick seller. Write today for complete outfit. Guaranteed Shoe Co., 2262 Third St., Dayton, O.

AGENTS—Men and women; sell Guaranteed Hosiery. Credit plan helps you. The line that repeats. Exclusive Agency to Hustlers. Address D. 1, Lehr Mfg. Co., Denver, Colo.

AGENTS—$2.50 Cutlery Set free with each set Forest Rose Rogers Silverware. Every woman buys. 80c profit each sale. 10 sales a day easy. $7 outfit sent on approval. Wilson Mfg. Co., B202, Lancaster, Ohio.

BOYS—Attention. Air rifles, boxing gloves for selling 24 packages of postcards, 10c each. Extra premiums for boys earning five within 90 days. Cooper Novelty Co., Dept. P., Box 741, San Francisco, California.

SURE money-maker, demonstrated one minute, sold next. Catalogue and sample free. Household Specialty Co., 6 High St., Lynn, Mass.

AGENTS—Earn $30 up weekly. Beginners shown how. Positions open now for new men. C. E. Swartzbaugh Co., Div. 104, Toledo, O.

AGENTS, we insert your name in Bressel's Agents Directory free. Bressel's Directory, 89 Ludlow St., New York, Dept. E.

HOLLAND Rusk and Dutch Cookies; brokers and agents write for particulars. Western Rusk Co., 820 E. Florida Ave., Denver, Colo.

$1 STARTS paying Mail Order Business at home. Particulars free. P. M. Box 115, Brooklyn, N. Y.

AGENTS wanted to handle our Home Educational, Writing and Drawing Chart. Every family needs one. Large profits. Send for agent's prices. Inland Mfg. Co., Topeka, Kans.

SIGN Letters. $1 per 100. Paul Jacob, 25 Third Ave., New York.

AGENTS—To sell latest sanitary invention; easy seller; big profits. Simplex Container Company, Box 618, Mobile, Ala.

ATTENTION — Sales Companies — Crew Managers! The most beautiful vacuum sweeper on the market. Challenge prices! Send $1 deposit immediately and we will express sample for inspection. Money back if unsatisfactory. Wilson B. Wickersham Mfg. Co., 530-8 South Clark Street, Chicago.

WHEN opportunity knocks, open the door. Here is your opportunity. For details, address Home Utilities Co.; Sta. A, Faribault, Minn.

MANUFACTURER wants Agents—Patented Kitchen article; just out; don't delay; write Underwood Mfg. Co., 804 East 12th St., Kansas City, Mo.

WANTED—General and local agents. Mary E. French, Clyde, Ohio.

AGENTS—Manufacture Excelsior polishing cloths. Formula, 25 cts. postpaid. Leroy Gipson, Rockland, Me.

AGENTS—Make money selling Ives Razor Paste. Box 25c. Write Lem Ives. Anderson, Mo.

AGENTS—We have a big seller with which you can make money easily. Write today for our proposition. Forward Manufacturing Company, Canso, Nova Scotia.

GENERAL Agents—Capable of calling on the big trade themselves and handling canvassers for the house to house and office to office business to sell the newest electric specialty on the market; sold everywhere there is electricity in the home, office, factory, store, hotel, liberal profits; sales-driving sample, weighs a pound no experience or knowledge of electricity required; shows how to use one light instead of two and get the same results; sells for $2.50, $3.50, $5 and saves the purchaser an investment of $25. Write for particulars. The Handy Light Co., 161 Handy Light Block, Cincinnati, Ohio.

$61.50 WEEKLY. Introducing and Selling a New Gas Light Burner for Kerosene Lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Samples free. Why not try one on your lamp? Beware or imitations. No branch offices. Luther Manufacturing Co., Dept. 141, Cincinnati, Ohio.

MAKE More Money! Start in the Mail Order Business—operate our "Silent Salesman" system—can be done in spare time and the possibilities are unlimited. But don't invest any money in the Mail Business until you read "Booster" for The Booster Magazine starts you in business for yourself—it puts you next to the best money making propositions on earth—ones that really get you the money! Send 10c for two months' trial subscription. Booster Magazine, Northwestern Building, Chicago.

AGENTS—New "Colonial" 10 piece Aluminum Set. An unparelled opportunity. The aluminum trust prices smashed. A fortune for you in next six months with this special. Housekeepers wild over it; don't delay a minute. Dundee Mfg. Co., 46C Chauncy St., Boston, Mass.

EVERYBODY will buy our Manicure Set. Just show the sample. Price is low. Big profits. Full instructions with each set in handsome case. Agents, both sexes; write for particulars. Justi Company, Inc., 401 Matthews Bldg., Milwaukee, Wis.

EXCEPTIONAL opportunity for agents with limited capital to sell private trade and stores, celebrated C. R. L. cigars. Lovell, 144 Grant St., New York.

BETCHER Life our Household or Novelty lines are Munimakers. Large profits. State line desired. Bydoll Supply Co., 113 Monroe, Chicago.

AGENTS—$10 daily. New Patented Novelty. Everyone who writes, buys. 25c brings sample. Act promptly to obtain exclusive territory. X-L-All Novelty Co., Box 1428, Los Angeles, Calif.

SEE our ad for Agents. Embossed Letter Co., Chicago.

KEY Checks—$1.45 per 100—35 styles. Steel dies for stamping names and addresses, key rings, watch fobs, umbrella plates. Get into the business. We show you how to make $5 per day. Pease, Diemake, Dept. M, Winchester, N. H.

WRITE for Bargain Catalogue. Crosby Co., Box A, North Conway, N. H.

AGENTS—Big profits selling an necessity that sells on sight in every home and office. Write at once for full particulars and territory wanted. Theurer Specialty Co., D3022 Seymour Ave., Cleveland, Ohio.

SEE our ad for Agents. Embossed Letter Co., Chicago.

SHAVEZY Guard makes Safety Razor of your own favorite blade. Excellent line for shopmen everywhere. Sample 25c. Particulars, red stamp. Keon Mfg. Co., Waltham, Mass.

AGENTS—Write it! Enclose stamp. Brief Road and Fishing trips. MSS returned or check. The Avalon Book-Exchange, Avalon, Calif.

AGENTS—Get next to this money getter. Sell only one dozen a day make $9 a day profit; particulars free. Renner Sales Co. A, Bismarck, N. D.

AGENTS—Attention—A perfect washing machine for $3. Agents wanted. A money maker. Allan Co., Joplin, Mo.

REMNANT Store, 1331 E. Linn, Cincinnati. Greatest Dry Goods Bargains on Earth. Proposition to agents and storekeepers.

DON'T fail to read Independence and Fortune under Business Opportunities.

SELLS everywhere; 100% profit. Shakespeare Co., 428 Camp Ave., Braddock, Pa.

AGENTS—Live hustling men to canvass the homes and offices, selling my new electric device. Cuts electric bills in half. A demonstration sells it. Repeat order getter. You can make big money without previous experience. Complete outfit and selling instructions, $5.45 and I guarantee money back if not satisfactory. Exclusive territory is going fast. Write me today for my proposition. Stanley B. Freiberg, 137 Station F, Cincinnati, Ohio.

$8 DAILY for workers. Something new; a letter brings the job; samples, etc. Clinton Sales Co., Columbus, Ohio.

ONE agent in a town can make $10 daily selling "Naida" Embroidery Apparel Novelties. Easy to sell. Big profits. Sample materials and illus. Catal. free. Madison Embroidery Co., Desk P14, Chicago, Ill.

SALESMEN—Send your name and address to Raymond E. Wood, 125 Dreyer Bldg., Cincinnati, Ohio. I am the manufacturer's Sales Manager for the best household and office electric specialty ever invented. Sells for $3.50 and $2.50. Guarantee for credit or deposit required. Capable men only need apply. I want only a few men. The work is permanent, profitable and high-grade. You will be given territory and expected to produce business.

THE Post Office Department wants everybody to put up a mail box. Everybody wants our mail box. Because, it is the Acme of Simplicity and Compact beauty. Fastens to door casing in five minutes, burglar proof and convenient. 50c brings sample box and agent's proposition. Irvin Masters, Muncie, Indiana.

MEN to call on women and demonstrate money making, work saving, patented household article; sells for $2.50; half profit; not sold in stores; exclusive agency; new men sell 7 to 10 a day; samples loaned to men who want to work. Sales Manager, 103 Sycamore St., Milwaukee Wis.

DIAMONDS. You can sell diamonds. Do you want one for yourself? If interested write for full information, how to sell genuine diamonds with a sample easily carried on your finger. Send no money. Write for actual photographs of stones, and finger size card. Established 25 years. S. R. Weaver, Department 2, 1206 Chestnut Street, Philadelphia, Pa.

SEE our ad for Agents. Embossed Letter Co., Chicago.

MAGAZINE Subscription Agents will tell you we have the greatest 25c deal in the field, get in on it. Globe Circulation Agency, Milwaukee.

AGENTS—Pull my live wire, get good protfits, quick sales; article needed by all housekeepers and wage-earners; write Theo. F. Nehlsen, 676½ Exchange Street, Kenosha, Wis.

AGENTS—Here is a snappy new moneymaker. We give $2 kitchen sets free with each pair of our new self-sharpening patented scissors. 100% profit. Whirlwind seller. Gaubert sold 113 pairs in four days—profit, $82. Begley, 163 first week—profit, $120. A sure winner. Peoples Supply Co., B-54, Kansas City, Mo.

AGENTS. A sure big money maker. $5 to $10 per day easily made selling Bixby's Best Silver Cleaner for cleaning all metals without rubbing. This is no make believe but the real thing. No previous experience required. Write at once for sample package and proposition. E. G. McLacklan, 134 Pollock St., New Bern, North Carolina.

AGENTS—700 Things a Boy Can Make—Can you beat it? Set of 4 books that sell for only $1. Everyone is interested. Enough to keep a boy busy until he grows up. Parents want them for their lads. Good liberal commission. Exclusive territory. Write to Popular Mechanics, Book Dept., 318 W. Washington St., Chicago.

THE New "Swiftlit" Gasoline Lamps are far cheaper than any other, yet light instantly with ⅛ match like city gas; no alcohol used; radically new; portable or systems; 100 to 500 candle power at will; burners cheap for old lamps; Agents making money; great novelty; wholesale price for introduction. Planet Mfg. Co., Dept. 4, St. Louis. (Established 1868.)

AGENTS—Doesn't $10 to $20 a day appeal to you? That's what many of our agents make handling the Duplexo Vacuum Cleaner. Light, double suction; two years' guarantee; a wonder. Write today for territory, terms, etc. Duplexo Co., 103 South 5th St. Brooklyn, N. Y.

WE are the largest manufacturers of Twisted Wire Brushes in America. Highest grade goods, best service, highest profit. Write for our new catalog. You are sure to win. Fuller Brush Co., 33 Hoadley Place, Hartford, Conn. Western branch, Wichita, Kansas.

AGENTS—100% profit. New patented article. Never before on the market. Sells like wildfire. Every man and woman will buy. No competition. Big demand. Free sample. KnoDarn Mfg. Co., Room 25, Dayton, Ohio.

AGENTS: Our Columbia Folding Hand Bag is the best proposition on the market. Not sold in stores. Big profit. Write for terms and other big sellers. S. V. Diamond, 35 West 21st St., N. Y. C.

I WILL start you earning $4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston Mass.

(CELLULOSIA) Door Plates, new, lettering pure gold. Send for sample case. Nothing invested. 100% profit, sell to every house. Public demand them. La Fontaine, Inventor and Mfr., Sherburne, N. Y.

AGENTS—Convex Portraits, 60c; frames, 50c; pillow tops, 39c. Write J. E. Trabue, Fargo, North Dakota.

WANTED—Agents to sell one of the greatest household novelties ever invented. Sells on sight because every housekeeper wants it. W. H. Blake, Cheboygan, Mich.

WEEPING Doll—patented, very laughable. P. Box 7, Roslindale, Mass.

SMALLEST Alarm Clock, bible and telescope, 10c each prepaid. W. H. Garner, A-119 South Lafayette St., Evansville, Ind.

SIGN Agents—Painters—Something new and better. Attracto ready-made Gold and Silver letters. 21 kinds, easily applied. Make big money lettering store windows, making signs, and selling our line of flashing, sparkling chipped glass name-plates. No experience needed. Write for sample letter and catalogue and start at once. Address Attracto Sign Co., 2655 North Clark Street, Chicago, or 519 Pacific Bldg., San Francisco.

AGENTS own your own business; no capital needed; steady income selling our new changeable signs, gold and silver letters; in demand everywhere. Write for catalogue. Climax Novelty Co., 703 Gay Bldg., St. Louis.

AGENTS wanted for Oriental novelties, never before seen in America. Quick sellers. Repeaters. Immense profits. Shaw Kanematz, Box 529, Portland, Oregon.

AGENTS make $30.00 week by selling our 500 handy household articles; catalogue free. Scheff Co., Desplaines, Illinois.

PORTRAIT agents find our plan beats all others. Prompt shipments—rejects credited. 30 days' Credit. Catalogue of Portraits, Frames, Pillow Tops, Sheet Pictures and samples free. James C. Bailey & Co., Desk R-1, Chicago.

GUILFORD Kerosene Mantle Lamps are replacing ordinary lamps like lamps replaced candles. Our live agents will average $30 weekly all winter. Guilford Co., Seville, Ohio.

SPHINX Ink—nongumming, noncorrosive, acid or alkali proof, 200% profit. Sells from pocket. Excellent side line. Compressed cylinder making 8 ounces and proposition, 10c. Bayless Sons Company, Muncie, Indiana.

BURGLAR Proof Door Fastener—attached instantly without tools. Sample, 25c silver. Burglar Proof Lock Company, 435 River, Dayton, Ohio.

PORTRAIT Agents—Send for free catalog Portraits, Frames, Medallions, Pillow Tops, Sheet Pictures, etc. Prices, quality considered, lowest of any. Pioneer Portrait Co., 1265 W. 63d St., Chicago.

I WANT salesmen to sell an advertising novelty of merit. Side line or exclusive. Sample free. Desk 1, Andrew Paysen, Clinton, Iowa.

GOLD Sign Letters—Immense profits; competition defied in variety, quality, price; sample free. Johnston Co., Quincy, Ill.

AGENTS—What size Silk Hose do you wear? Send no money. Write today. Offer expires 30 days. Agents wanted in every town. Large profits. Beautiful line. Triple-Wear Mills, Dept. D., 112 So. 13th St., Phila., Pa.

ANYONE can make big money easy selling the Aladdin Kerosene Mantle Lamp. No experience necessary. A demonstration sells a lamp in nine out of ten homes. One agent sold over 1,000 on money-back guarantee, not one returned. Another made over $300 in 15 days. Hundreds doing as well. Evenings may be made profitable. Special introductory offer to the first man in each neighborhood who writes for agency proposition. Mantle Lamp Co., 351 Aladdin Bldg., Chicago, Ill.

AGENTS! $5 a day. Samples and catalogue free. Ideal Household Device Co., Newport News, Va.

AGENTS on salary or commission. The greatest agent's seller ever produced; every user of pen and ink buys it on sight; 200 to 500 per cent profit; one agent's sales amounted to $620 in six days; another $32 in two hours. Monroe Mfg. Co., X., 6, La Crosse, Wis.

EARN $15 to $25 a week or more as our Mail Order Dealer Right from your own home. Hold your position until entire time is required. We are manufacturers and owners of patented just-in-season specialties. If you are just starting a Mail Order Business or if already established, you can't afford not to handle our Patented Money-Making Getters. We sell exclusively to our Mail Order Dealers. We protect them. We carry stock and furnish everything. No canvassing. Small capital. Experience unnecessary. Write today for Latest Patented Leader and Manufacturer's Easy Selling Mail Order (copyrighted) plan backed up by "Whole Truth." Positive Proof and Sworn Statement. J. M. Pease Mfg. Co., 539 Pease Bldg., Main St., Buffalo, N. Y

NAME on Rubber Stamp, 15c; with address, 25c. National Stamp Works, 42 N. Fifth Ave., Chicago. Catalogue.

AGENTS—250% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1962 Third St., Dayton, Ohio.

AGENTS—Handkerchiefs, dress goods. Carleton made $8 one afternoon; Mrs. Bosworth, $25 in two days. Free samples. Credit. Stamp brings particulars. Freeport Mfg. Company, 59 Main St., Brooklyn, N. Y.

AGENTS—Portraits 35c. Frames 15c. Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., Dept. 1196, 1027 W. Adams St., Chicago.

$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., G. W., Chicago.

AGENTS Wanted—Sell Rich Looking, imported 36x68 rugs, $1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profits, $57. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Stonington, Maine.

WE furnish yo capital to run a profitable business of your own. Become our local representative and sell guaranteed Sweaters, Shirts, Neckties, underwear and hosiery direct from our factories to the homes. Write, Steadfast Mills, Dept. 12, Cohoes, New York.

AGENTS—Easily earn $25 to $40 per week selling Kno-Darn Guaranteed Hosiery; direct-from-the-mill proposition; 20% better; costs less; M. Garwood sold $400 worth in six weeks; send for free sample; no money required. Kno-Darn Hosiery Mills, Desk 15, Dayton, Ohio.

TRY our-up-to-the-minute window letters. None "just as good." Slann Sign System, Deroit, Mich.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

Be Independent! Start a mail order business in your own home. We tell you how, and furnish everything needed wholesale. An honorable and profitable business for man or woman. Particulars free. Many make $3,000 a year. Murphy Mfg. Co., South Norwalk, Conn.

AGENTS: Our specialties spell easycash. Adam Fisher Mfg. Co., 61-15, St. Louis, Missouri.

SELF threading needles. 10c a paper. Agents' samples and terms free. Ladies' Art Co.; Dept. 41, St. Louis, Mo.

AGENTS—Make $5 daily handling our up-to-date Door Plates, Name Plates, House Numbers, Signs, etc. Samples free. Brett Bros., Boston, Mass.

MEDALLIONS sell at sight, 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

HUSTLING Agents Wanted for our fast selling Sanitary Household Brushes. Steady work. Big profits. Postal brings particulars. Dept C. Hale & Kavanek, New Britain, Conn.

WANTED Salesmen—Earn $250 per month, sell dealers highly advertised article. Elato Co., Station L, New York, N. Y.

BOKARA Diamonds—Agents, everyone, to wear and sell our famous Bokara Diamonds. Write for sample offer and catalogue Free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

AGENTS—$50 weekly; we manufacture the best needle case made a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over $100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

AGENTS—County and State; men and women everywhere to sell the Pinless Clothes Line; a practical labor saving invention, lasts life-time, sells on sight, gives perfect satisfaction. Agent Sutton of Georgia, sold over million feet; 100% profit; write quick for exclusive territory; information free; sample prepaid 25c stamps. Pinless Clothes Line Company, 520 Wilcox Bldg., Portland, Oregon.

AGENTS—We manufacture glass paper, Plain glass windows made to look ilke real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S H. Parrish & Co., 202 S. Clark St., Chicago.

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AGENTS Wanted:—Mechanics and shopmen make over $100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 67 Bar St., Canton, O.

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400% PROFIT selling Gordon Photo Pillow Top. High grade work. Samples and catalogue free. Luther Gordon Co., Northwestern Bldg., Chicago.

WE manufacture six fascinating game boards, 100% profit. Orders repeat. Can be carried as side line where Candy, Pipes and Cigars are sold. Particulars free. Unique Novelty Co., Independence, Ia.

PERFECTION Pocket Adding Machine. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R, Cincinnati, Ohio.

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

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SIX hp. steam engine, twelve hp. boiler. Practically new. Bargain. Griffin, Lenoxville, Pa.

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UNIQUE engines are small, powerful and compact. See our ad on page 117. Amateur Mechanics Supply Co.

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PATTERN makers! A book devoted to the principles of pattern and core making and molding. Written by G. H. Willard, a practical pattern maker of years experience. This book, just published, treats the subject in a much more simple, direct and effective manner than most books along this line. 224 pages, 312 illustrations. Price $1.00 postpaid. Popular Mechanics Book Dept., Chicago.

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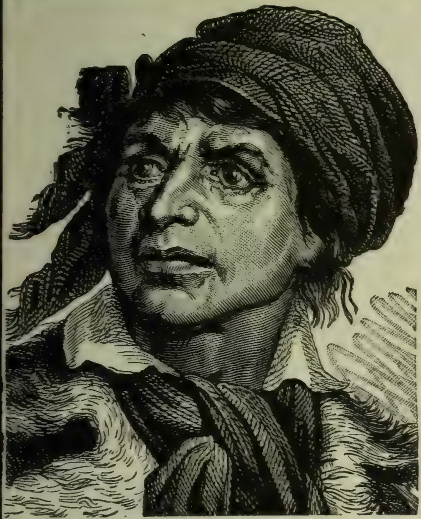

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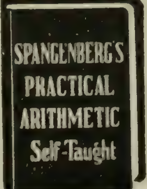

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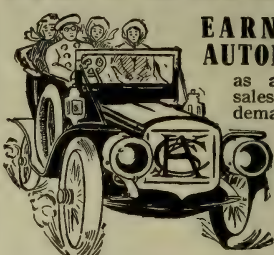

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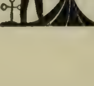

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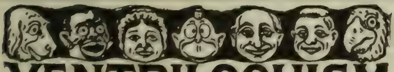

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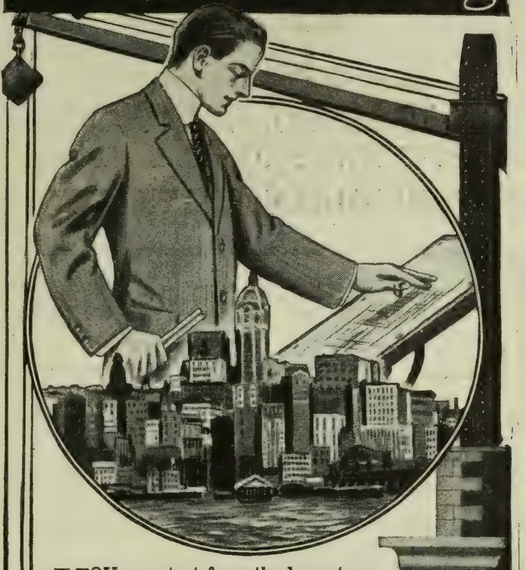

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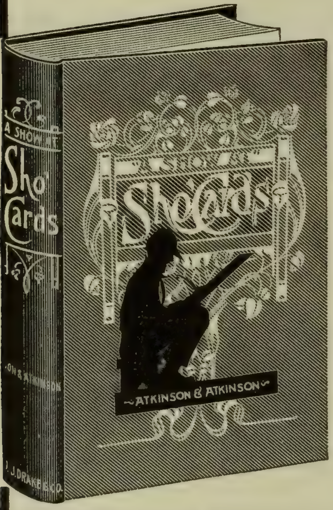
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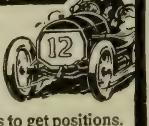

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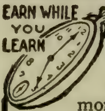

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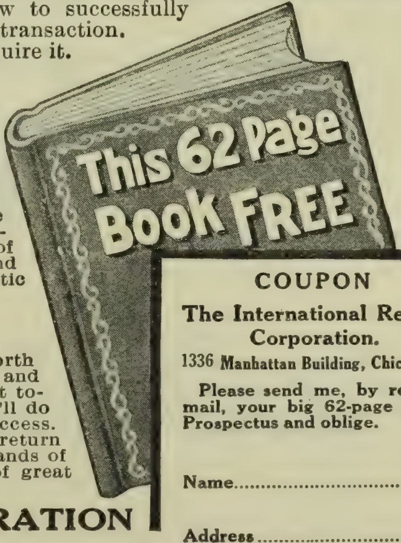

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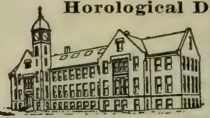

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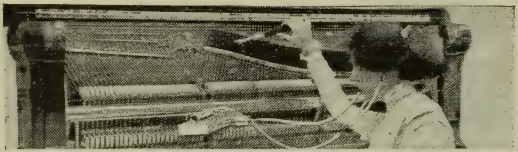

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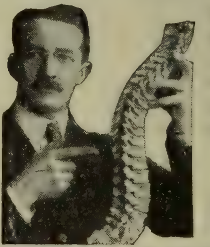

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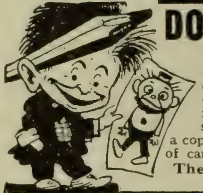

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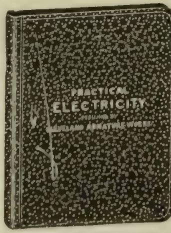

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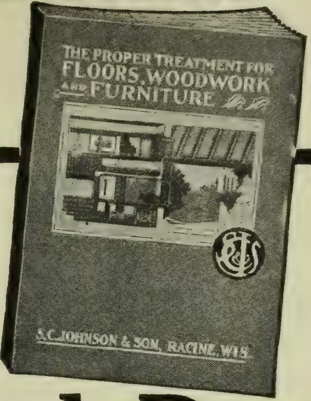
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is a *dye* in every sense of the word—it *penetrates*—deeply—into the wood bringing out its natural beauty *without raising the grain.* It dries in 30 minutes and does not smudge or rub off. It is made in sixteen beautiful shades, as follows:

No. 126 Light Oak
No. 123 Dark Oak
No. 125 Mission Oak
No. 140 Early English
No. 110 Bog Oak
No. 128 Light Mahogany
No. 127 Ex. Dk. Mahog.
No. 129 Dark Mahogany
No. 130 Weathered Oak
No. 131 Brown Weathered
No. 132 Green Weathered
No. 121 Moss Green
No. 122 Forest Green
No. 172 Flemish Oak
No. 178 Brown Flemish
No. 120 Fumed Oak

Ask your painter or paint dealer to show you panels of wood finished with Johnson's Wood Dye and Prepared Wax.

Johnson's Prepared Wax

is a complete finish and polish for all wood—floors, woodwork and furniture—including pianos. Just the thing for mission furniture. Very easy to use. Can be successfully applied over all finishes, imparting a velvety, protecting finish of great beauty.

Johnson's Artistic Wood Finishes are for sale by leading paint, drug and hardware dealers everywhere. Ask for the FREE book and samples. If your dealer does not have them, mail this coupon and we will see that you are supplied.

S. C. Johnson & Son
Racine, Wis.
The Wood Finishing Authorities

Polishing Furniture With JOHNSON'S PREPARED WAX

Coloring Wood With Johnson's Wood Dye

Please Use This FREE Coupon

If your dealer cannot supply you with booklet, edition PA12 and samples of Johnson's Wood Dye and Prepared Wax, fill out this coupon and mail to S. C. Johnson & Son, Racine, Wis. Mention shades of Dye desired.

Name..............................

Address..............................

....

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Stop Wearing Out

Up and down—in and out—rain and shine—year in and year out—wearing out the steps—wearing out themselves—but getting nowhere—that's the life tragedy of thousands who would have reached high positions if they only had the right training.

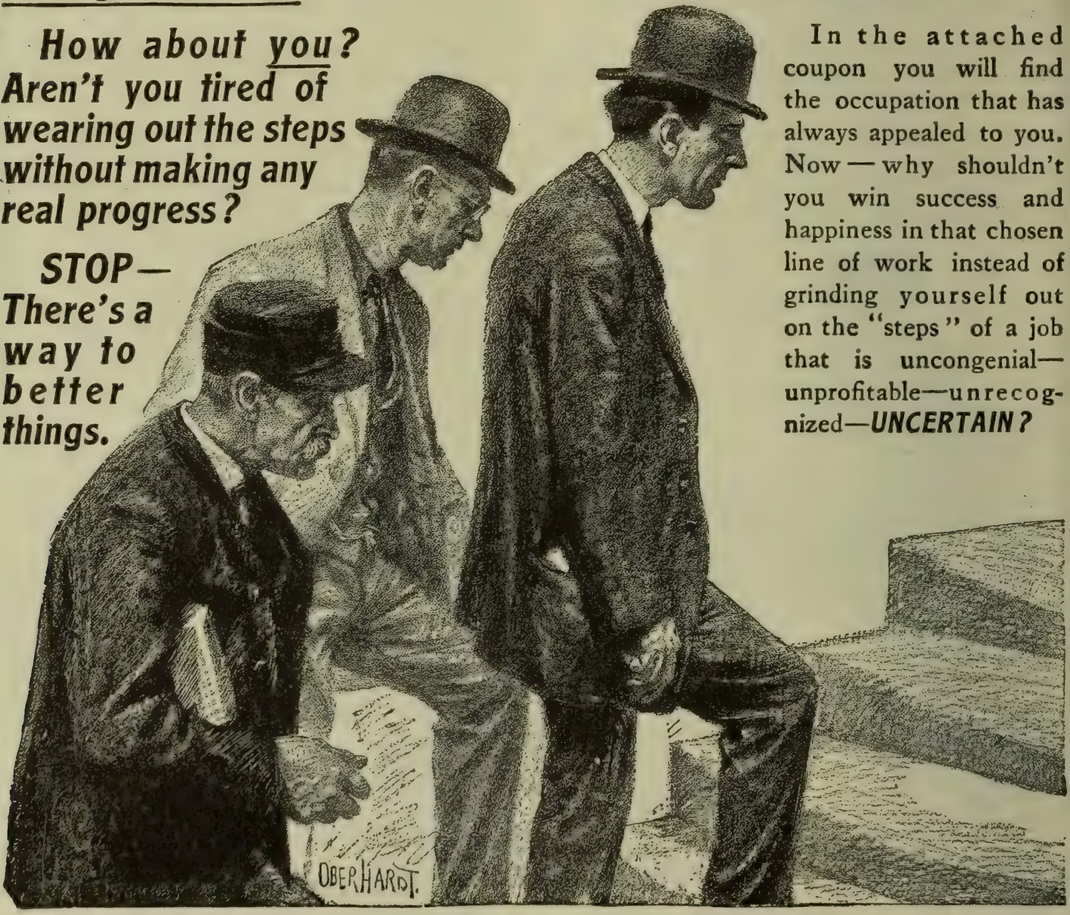
How about you? Aren't you tired of wearing out the steps without making any real progress?

STOP—There's a way to better things.

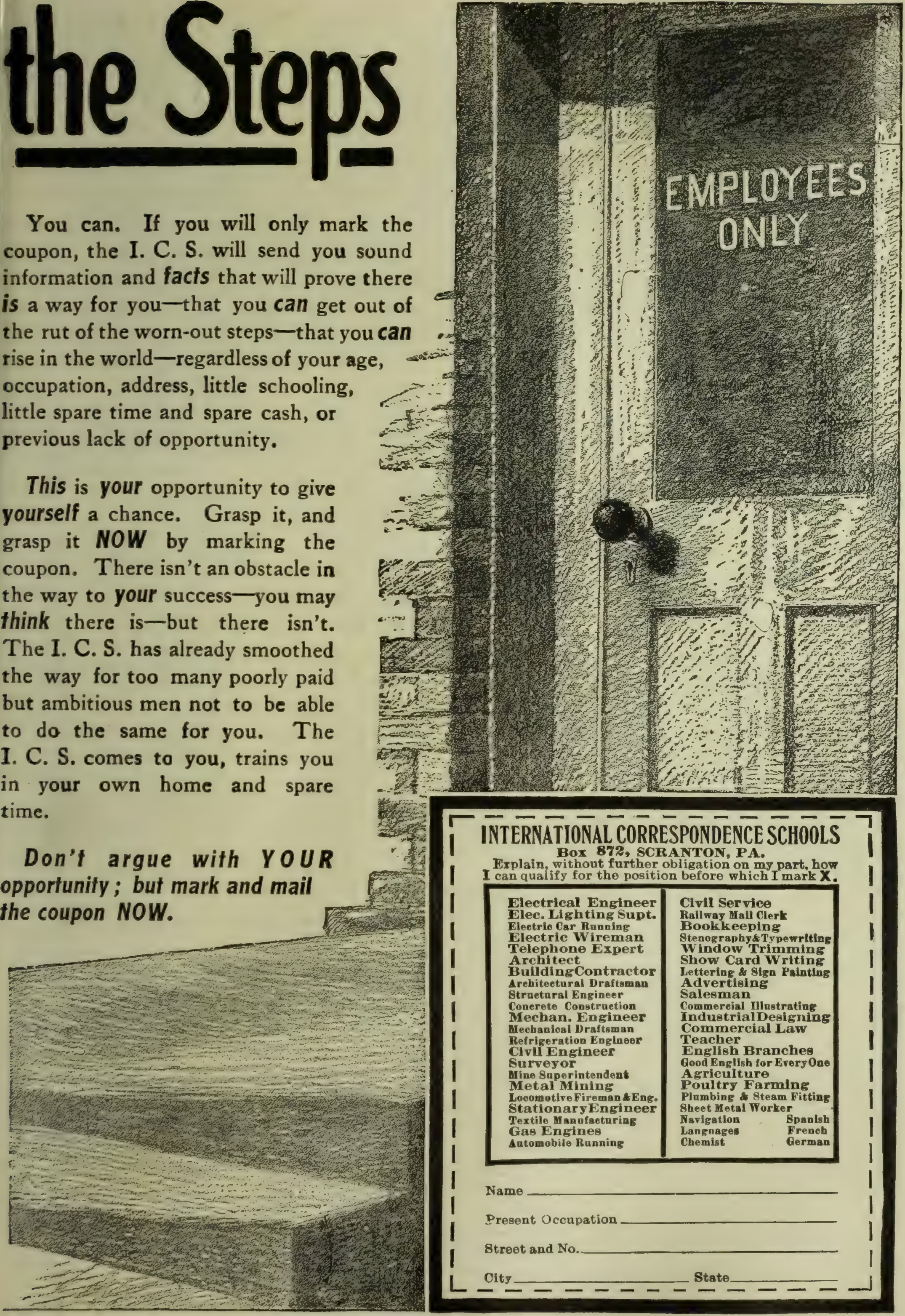
Every month, over four hundred men of all ages and occupations ***voluntarily*** report advancement in position and salary wholly due to I. C. S. training. You simply cannot dodge a fact like that. It means that these men have stopped "wearing out the steps" that lead nowhere, and have made a place for themselves in the world.

The same way by which these men succeeded is open to you. Surely you have sufficient ambition to learn what that way is. Finding out costs you nothing and involves no obligation on your part.

In the attached coupon you will find the occupation that has always appealed to you. Now — why shouldn't you win success and happiness in that chosen line of work instead of grinding yourself out on the "steps" of a job that is uncongenial—unprofitable—unrecognized—***UNCERTAIN?***



the Steps



You can. If you will only mark the coupon, the I. C. S. will send you sound information and *facts* that will prove there *is* a way for you—that you *can* get out of the rut of the worn-out steps—that you *can* rise in the world—regardless of your age, occupation, address, little schooling, little spare time and spare cash, or previous lack of opportunity.

This is ***your*** opportunity to give ***yourself*** a chance. Grasp it, and grasp it ***NOW*** by marking the coupon. There isn't an obstacle in the way to ***your*** success—you may ***think*** there is—but there isn't. The I. C. S. has already smoothed the way for too many poorly paid but ambitious men not to be able to do the same for you. The I. C. S. comes to you, trains you in your own home and spare time.

Don't argue with YOUR opportunity; but mark and mail the coupon NOW.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 872, SCRANTON, PA.
Explain, without further obligation on my part, how I can qualify for the position before which I mark **X**.

Electrical Engineer
Elec. Lighting Supt.
Electric Car Running
Electric Wireman
Telephone Expert
Architect
Building Contractor
Architectural Draftsman
Structural Engineer
Concrete Construction
Mechan. Engineer
Mechanical Draftsman
Refrigeration Engineer
Civil Engineer
Surveyor
Mine Superintendent
Metal Mining
Locomotive Fireman & Eng.
Stationary Engineer
Textile Manufacturing
Gas Engines
Automobile Running

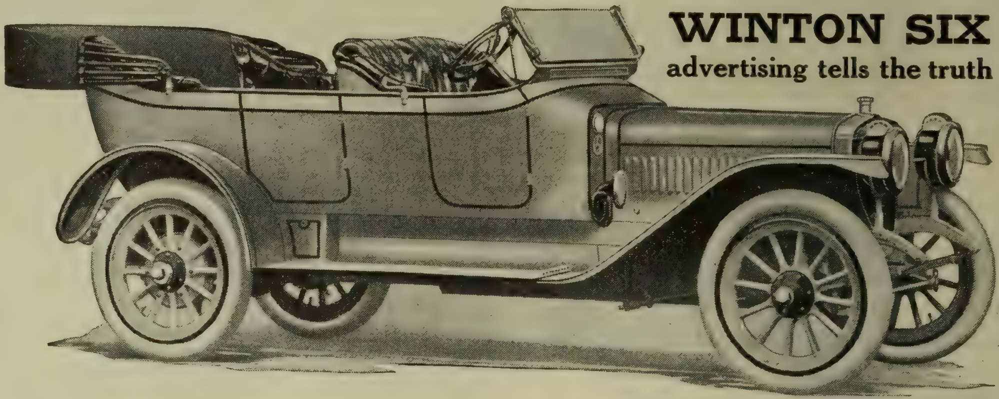
Civil Service
Railway Mail Clerk
Bookkeeping
Stenography & Typewriting
Window Trimming
Show Card Writing
Lettering & Sign Painting
Advertising
Salesman
Commercial Illustrating
Industrial Designing
Commercial Law
Teacher
English Branches
Good English for Every One
Agriculture
Poultry Farming
Plumbing & Steam Fitting
Sheet Metal Worker
Navigation **Spanish**
Languages **French**
Chemist **German**

Name ____________

Present Occupation ____________

Street and No. ____________

City ____________ State ____________



WINTON SIX
advertising tells the truth

Making the Right Thing Right

These are six-cylinder times. Everybody knows it.

A few years ago, only one manufacturer in the world had the foresight to see six-cylinder times ahead and the courage to hasten their coming. That was Alexander Winton.

Pioneering the Six

In June, 1907, Mr. Winton became the world's first maker of Sixes exclusively. He was on the right road. The six-cylinder times of today prove it.

More than that, he made the right thing *right*. That also is proved.

Because the Winton Six that was first marketed in June, 1907, is being marketed today, just as he made it then, without a single radical change in any important part of its construction.

The body lines and seating arrangements are new this year. But the car itself, as originally designed and produced, was so far *ahead-of-the-times* that it has set a new world's record for *freedom from faults*.

Leading the Sixes

The Winton Six is *up-to-the-minute* in everything that makes a high-grade car worth having, and it is the best proved six in the world.

Sixth consecutive year of success without requiring a single important change.

Always a self-cranking car—the first self-cranking car on the market.

Continuous holder of the world's lowest repair expense record.

The car that converted the industry from fours to Sixes.

And—

The car that costs you the least money for "overhead" charges. Because we are free from watered stock, funded debt, and other burdensome overhead, we are able to put into the Winton Six all the quality any car can have and sell it to you at a price that stops competition—$3000.

The greatest value in the world.

Shall we send our latest catalog?

THE WINTON MOTOR CAR CO., 24 Berea Road
CLEVELAND, O.

Winton Company Branch Houses in New York, Chicago, Boston, Philadelphia, Baltimore, Pittsburg, Cleveland, Detroit, Milwaukee, Minneapolis, Kansas City, San Francisco and Seattle.

The Present *with a* Future

Waterman's Ideal Fountain Pen

MCMXII
MCMXII
WATERMAN'S SAFETY IDEAL FOUNTAIN PEN
WATERMAN'S IDEAL NEW YORK

This Quality Pen Appeals To Everyone

NOTHING could serve the purpose of Christmas giving more acceptably than Waterman's Ideal. It is of the useful sort that is increasingly advocated. Gifts of this pen mean an end to inky fingers and scratchy penmanship, and a convenience that will facilitate a friend's business or social writing for years to come. The exclusive success of the Waterman patents and the care in making the pens are known throughout the civilized world. There is a pen for every member of the family in large and small sizes, plain or handsomely mounted in gold or silver, and with pen points to fit every handwriting; then there is a Safety type for women, and the Self-Filling Waterman's Ideal. Pens are exchangeable after Christmas to suit the hand. Our illustrated folder sent free, will assist you in selecting.

Avoid Substitutes

Safety Type
Plain or Chased
No. 12½ V. S.
Purse Size
No. 12½ S.
Pocket Size
$3.00
Either Size Gold Banded
$1.00 extra
Also in larger sizes

In attractive Christmas Boxes.

Your Local Dealer
will assist you in your selection

Self-Filling Type
Gold Banded
No. 12 S. F. $3.50
No. 14 S. F. $5.00
Also plain
No. 12 S. F. $2.50
Clip-on-Cap extra:
Sterling Silver 50c

L. E. Waterman Co., 173 Broadway, N. Y.
24 School St., Boston 115 So. Clark St., Chicago
17 Stockton St., San Francisco
107 Notre Dame St., W., Montreal Kingsway, London 6 Rue d'Hanovre, Paris

Regular Type
Sterling Silver
No. 412 Fil.
$5.00
Size larger
No. 414 Fil.
$7.00
Plain (without mounting)
No. 12 $2.50
No. 14 $4.00
Clip-on-Cap 25c extra

AMERICAN TELEPHONE & TELEGRAPH CO.
LOCAL AND LONG DISTANCE TELEPHONE
BELL SYSTEM
AND ASSOCIATED COMPANIES

"Harvest"—by Vincent Aderente.

Prosperity

There has been a bumper crop.

This is because the tillers of the soil have been industrious, and the rain and the sun have favored their plantings.

There has been industrial activity.

The makers of things in factories have been busy. They have had work to do and pay for doing it.

There has been commercial success.

The people who buy and sell and fetch and carry have been doing a lot of business and they have been paid for doing it.

The country is prosperous because all the people have been busy.

Good crops and good times can be enjoyed only when the Government maintains peace and harmony.

This task of the Government is made comparatively easy because the American people have been enabled to become so well acquainted with each other. They know and understand one another. They are like one family.

The producer and consumer, no matter where they live, are close together.

This is largely due to our wonderful facilities for intercommunication. We excel in our railways, our mails and our telegraphs, and, most of all, in our telephones.

The Bell System has fourteen million miles of wire spread over all parts of the country. Each day there are twenty-five million telephone talks all the way from twenty feet to two thousand miles long.

The raiser of crops, the maker of things, and the man of commerce, all are helped to co-operate and work together for peace and prosperity by means of the Universal telephone.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AND ASSOCIATED COMPANIES

One Policy ***One System*** ***Universal Service***

Christmas is the time for providing your good friends with some of the little luxuries and conveniences they are too busy or too unselfish to discover for themselves.

A luxury that becomes a necessity the first time it is used! That's an ideal gift and exactly describes a *Moore* pen. Every one you give away you may be sure will be in constant daily use for years to come, for a person who has once known the comfort of a *Moore's* feels handicapped without it.

Study your Christmas list; you are sure to find several friends in need of a *Moore* pen. You can think of nothing else that will prove so useful and so faithful a reminder of your thoughtfulness. A Christmas gift is valued for its service as well as the thought behind it.

Moore's is the only fountain pen that can be carried anywhere or in any position without danger of leaking. It's a pen of very few parts, so simply constructed that it can't get out of order. When not in use the pen point lies submerged in ink so that it's always moist and ready to write freely at the first stroke. No other pen is so easily and quickly filled. Just take off the cap and drop in the ink.

Moore's are made in various sizes and lengths of barrels with pen-points to suit any hand.

PRICES RANGE FROM $2.50 TO $5.50

Moore's Midget is just the thing for a lady to carry in her pocket-book or bag.

For the holiday season, the pens are put up in attractive Christmas boxes. Those who wish to make a more elaborate gift can select pens with gold and silver bands, filigree work and solid gold and silver overlay, ranging in price from $5.00 to $45.00. These are encased in special leather gift boxes lined with satin.

Every Moore Non-Leakable Fountain Pen carries with it the most unconditional guarantee

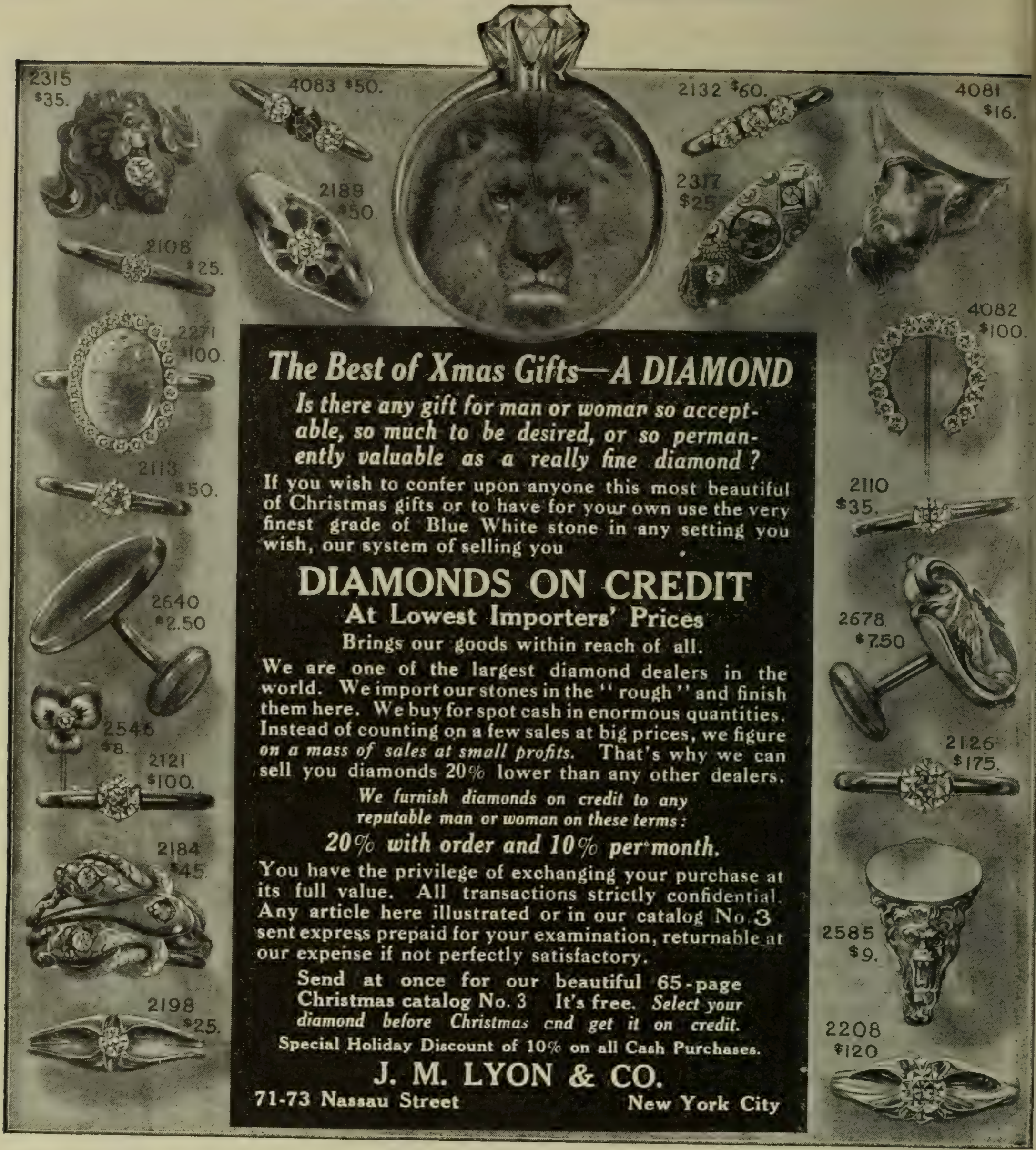
BE SURE IT'S A MOORE

For Sale By Dealers Everywhere

AMERICAN FOUNTAIN PEN COMPANY

ADAMS, CUSHING & FOSTER, Selling Agents

168 Devonshire Street - - BOSTON, MASS.



The Best of Xmas Gifts—A DIAMOND

Is there any gift for man or woman so acceptable, so much to be desired, or so permanently valuable as a really fine diamond?

If you wish to confer upon anyone this most beautiful of Christmas gifts or to have for your own use the very finest grade of Blue White stone in any setting you wish, our system of selling you

DIAMONDS ON CREDIT

At Lowest Importers' Prices

Brings our goods within reach of all.

We are one of the largest diamond dealers in the world. We import our stones in the "rough" and finish them here. We buy for spot cash in enormous quantities. Instead of counting on a few sales at big prices, we figure *on a mass of sales at small profits.* That's why we can sell you diamonds 20% lower than any other dealers.

We furnish diamonds on credit to any reputable man or woman on these terms:

20% with order and 10% per month.

You have the privilege of exchanging your purchase at its full value. All transactions strictly confidential. Any article here illustrated or in our catalog No. 3 sent express prepaid for your examination, returnable at our expense if not perfectly satisfactory.

Send at once for our beautiful 65-page Christmas catalog No. 3 It's free. *Select your diamond before Christmas and get it on credit.*

Special Holiday Discount of 10% on all Cash Purchases.

J. M. LYON & CO.

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WEAK ANKLES don't Hinder with the

KENNEDY SKATE

The Kennedy brace makes your ankle as strong as the steel itself without hindering the free movement. Clothing conceals the small extra parts. It is fastened in 10 seconds and will improve your skating 100 per cent at once. Weighs less than the ordinary skate. Prices $3.50 and $4.50. Ask to see the **KENNEDY TWO-WHEEL ROLLER SKATE.** Same principle as ice skates. They make roller skating a delight. Price $5.00. **KENNEDY SKATES** are sold at department, hardware and sporting goods stores or sent prepaid on receipt of price by

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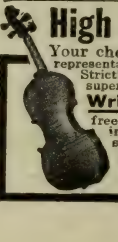


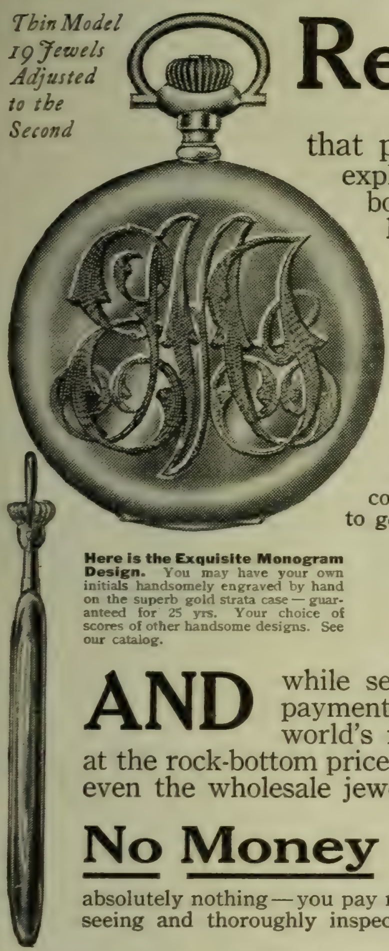
High Grade Violins 30 Days' Free Trial

Your choice from a large and carefully graded stock of representative instruments from the leading *foreign* violin makers. Strictly hand made and of superior tone, these violins are far superior to the average old violins sold at four times the price. **Write Today.** Don't fail to send your name and address today for the superb Lewis catalog sent free and postpaid. Of value to everyone interested in high grade instruments. Learn how you can have your choice of these superb instruments on a free trial in your home. *Write today.*

WM. D. LEWIS & SON (Est. 1869) 225 S. Wabash Ave., Chicago

OUR SPECIALTIES: Imported wood-varnishes and tools for violin makers.

Startling Watch Offer



Thin Model 19 Jewels Adjusted to the Second

Read! A Watch Offer Without Parallel.

Write for our Free Book on Watches—a book that posts you on watches and watch values—explains reasons for our most remarkable rock-bottom price offer DIRECT TO YOU on the highest grade Burlington.

IF YOU WANT a highest grade watch (ladies' or gentlemen's), or if you ever expect to own such a watch, write NOW for the FREE Burlington Book. See coupon below.

We **won't** "knuckle down" to selling systems that maintain high prices by contracts, so we have decided to make such a tremendous and wonderful offer direct to the public on a first class timepiece that no trust, no dealers under contract will or can stop us. **You, too,** will seize this opportunity to get the "Burlington Special" direct on this wonderful offer.

Here is the Exquisite Monogram Design. You may have your own initials handsomely engraved by hand on the superb gold strata case — guaranteed for 25 yrs. Your choice of scores of other handsome designs. See our catalog.

You should not buy a worthless watch just because it is cheap. Nor need you pay trust prices now for a top-notch watch. The free Burlington book explains.

AND while selling at rock-bottom prices we even allow easy payments on this introduction. $2.50 a month for the world's most superb time-piece! The easiest payments at the rock-bottom price — the **Rock-Bottom** price—the same price that even the wholesale jeweler must pay.

No Money Down

We ship the watch on approval, prepaid (your choice of ladies' or gentlemen's open face or hunting case). You risk absolutely nothing — you pay nothing — not one cent unless you **want** the great offer after seeing and thoroughly inspecting the watch.

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Kimball Pianos
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We extend to you a most cordial invitation to thoroughly investigate the splendid merits of the new style Kimball Pianos, through our catalogues and literature that we will be pleased to send you, postage paid, or at the nearest Kimball dealer's store, or by our *Free Approval Test in Your Own Home.*

Kimball Result of Half Century of Experience

Kimball Pianos and Kimball 88-note Player-Pianos are the product of 55-years' experience, good material and good intentions, and the INTENT of the manufacturer marks the difference between things made to *sell* and things made to SERVE. The makers of Kimball Pianos find it profitable to devote more thought to the making than to the selling, thus orders for Kimball Pianos are always a little in advance of the production.

Greatest Factory—Largest Capital

Operating the largest piano factory in the world, employing the largest cash capital, buying raw material in the greatest quantities for cash, the Kimball System of manufacturing and distributing enables us to furnish you the best of piano quality for the least money.

Write for Money Saving Plan
Catalogues and Easy Payment System

If you want a piano at all you want a good one; a mere pretty case with no lasting musical quality will not do. Secure the old reliable Kimball for your home and be the owner of a piano you will always be proud of.

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Please send me free your Piano or Player-Piano Catalogues, prices and terms and the Musical Herald containing two pretty songs, words and music.

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City ....
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A Marvelous Synthetic Gem
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—the greatest triumph of the electric furnace. ***Will cut glass***—stands filing, fire and acid tests like a diamond—guaranteed to contain no glass. Remoh Gems have no paste, foil or backing—their brilliancy is guaranteed forever. One-thirtieth the cost of a diamond. These remarkable gems are set only in 14 Karat Solid Gold Mountings.

Sent On Approval Anywhere In U. S. —your money cheerfully refunded if not perfectly satisfactory. Write for our 4-color De Luxe Jewel Book—yours for the asking. Address

Remoh Jewelry Co.,
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THE BIGGEST ACORNS—Nature is very prodigal in her gifts to tropical countries, vegetation grows with extraordinary profusion, and fruit and seeds are of an immense size, says the Wide World. What is probably the largest acorn in the world, for instance, is found in New Guinea. Quite an ordinary Papuan acorn would be 1¾ in. in diameter, the cup being 2¼ in. and the falling acorn is capable of giving one quite a nasty knock on the head. The magnificent oaks which bear these giant acorns are veritable monarchs of the forest, and grow at an elevation of about three to four thousand feet.—Chicago Inter Ocean.

SOLID GOLD FILLED GUARANTEED 20 YEARS **$5.95**

Elegant thin model, open face, 20 year gold filled (guarantee stamped in case), plain polished or engine turned, screw back and bezel, dust proof, 14 size for men and boys or 0 size for ladies, fitted with 7 ruby jeweled adjusted patent lever movement, gold sunburst or white enamel dial, warranted a correct timekeeper.

$5.95 VERY THIN MODEL Stem Wind & Stem Set

IF YOU SEE IT YOU WILL BUY IT Let us send it without expense to you C. O. D. for examination at your nearest express office and if you think it a bargain and equal in appearance to any $35.00 gold filled watch pay the express agent our special sales price $5.95 and express charges and it is yours. Address

MUTUAL SALES CO., B29, Washington Blk., CHICAGO, ILL.

FOR HIS X-MAS GIFT
A REAL KNIFE FOR A REAL MAN

C. CAMERON
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Not the ordinary gift knife, but a genuine hand forged English razor steel knife that will cut and hold its edge—fully guaranteed. We will put any photo or lodge emblem on one side of the transparent handle, and any name and address on the other.

SPECIAL X-MAS OFFER:
No. 35 Carpenter Knife - $1.60
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Top cut is ⅔ and lower cut ⅓ actual size

GET YOUR ORDER IN NOW. Agents wanted everywhere. Write for catalog and terms.

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GUARANTEED 25 YEARS

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JUST USE COUPON

We Stand the Freight No money to deposit with us. No C.O.D. to pay; absolutely no obligation on your part to keep our high-grade Starck Piano if you do not feel that it is the best piano you ever saw. We ship it

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Regular $300 to $750 Pianos for $165 up. Small Monthly Payments.

We have so much faith in our Strictly Standard Starck Pianos that we are willing to ship them on FREE TRIAL to reliable people everywhere. We want to ship one to every reader of this magazine who is thinking of buying a piano. We want to put one in your home on our FREE LOAN PLAN, and let it do its own talking. We want you to compare its tone, its action, its beautiful artistic case with any other piano you can see or think of.

Send Today for Our Free Catalogue and Entire Free Trial Plan You will be surprised what a fine, real high-grade piano you can get direct from our factory for little money, and on payments to suit your convenience. In dealing with us you deal directly with the makers and we want you to write us right away,—simply say, "send me your catalogue and FREE Trial plan." We want you to know all about our big factory, how we deal direct with the people from our factory, and how we can actually save you, really and truly save you, $100 to $200 on the best prices you can get elsewhere on a **standard made piano.** We are now saving the people of this country thousands of dollars annually, by selling our fine Strictly Standard Starck Pianos direct to the purchaser, saving exorbitant middlemen's profits.

50 Music Lessons FREE

We want you to have our wonderful catalogue, extraordinary prices and terms, also information about FREE music lessons. *Write today before you forget it.*

P. A. STARCK PIANO CO.
128 Starck Building CHICAGO

SEND THIS COUPON TODAY

P. A. STARCK PIANO CO., 128 Starck Bldg., CHICAGO
Please send me your Piano Catalog, confidential prices, terms and information regarding FREE MUSIC LESSONS.

NAME..
CITY..
ST. No..
STATE..
R. F. D..

Flexible Flyer

“Th
sle
tha
steers’

Wins
Every
Race!

The ideal Christmas gift for boys and girls

Gives an added zest to coasting because it can be steered *at full speed* **around** all obstacles. Ligh
enough to easily pull up hill—yet so strong it

outlasts 3 ordinary sleds

The **grooved runners** insure greater speed, and absolutely prevent “skidding.” The famous steering-bar does away entirely with dragging feet, wear and tear on boots and shoes, wet feet, colds, etc. No other steering sled has the exclusive features of the Flexible Flyer. *Be sure to* **look for** the grooved runners and **this trade-mark.**

FLEXIBLE FLYER
TRADE-MARK

FREE **Cardboard working model of the Flexible Flyer and handsome booklet.**

Just say “send model and booklet” and we’ll gladly send them FREE. *Write today!*

The only sled with grooved runners!

S. L. ALLEN & CO., BOX 1101 G **Philadelphia**

SAVE YOUR FACE OIL YOUR RAZOR

Rust causes razor dullness. 3-in-One absolutely **prevents rust** on the minute “teeth” of every razor blade. Always do this **before** and **after** shaving: Draw blade between thumb and forefinger moistened with a little 3-in-One. If an “ordinary” razor, oil strop, too. Then —strop and have the most luxurious shave of all your life. Oil blade again before putting away.

3-in-One is sold everywhere in 3 size bottles: Trial size, 10c; 3-oz., 25c; 8-oz., (half pint) 50c. Also in Handy Oil Cans, 25c.

FREE—Generous sample and scientific “Razor Saver” circular.

3-IN-ONE OIL COMPANY
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DISEASE OF TREES—The disease of chestnut trees now causing serious injury in the Eastern States was first noticed about the year 1904 in the vicinity of New York, and is believed to be due to the growth of a hitherto unknown fungus described by Murrill in 1906 under the name of Diaporthe parasitica.—Columbus Dispatch.

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A Frenchman invented the envelope in 1653.

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Give your children safe skates that will last and keep sharp longest. Write for new catalogue No. 12, containing rules of leading Hockey Associations.

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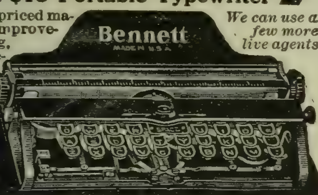

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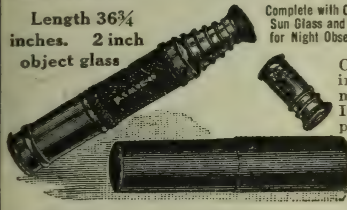

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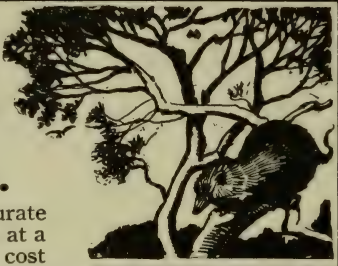

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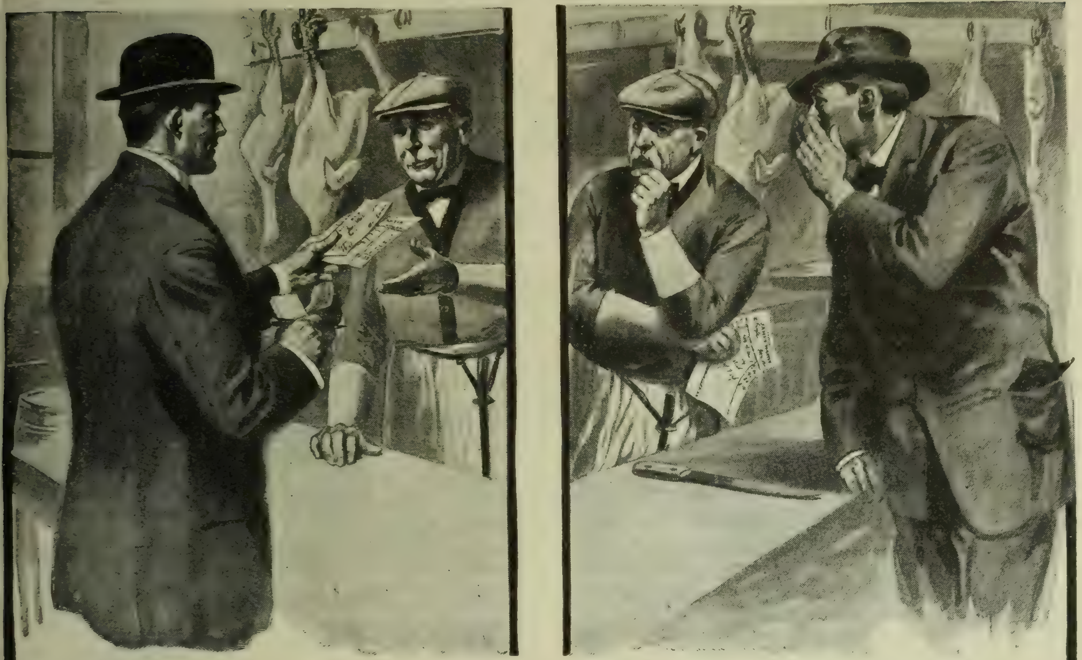

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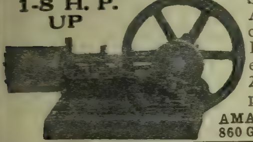

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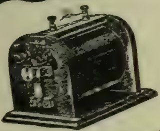

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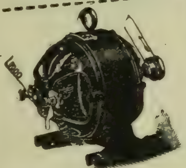

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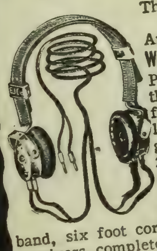

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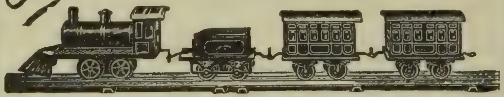

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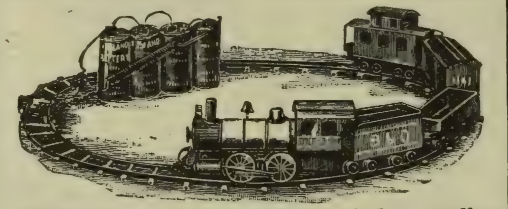

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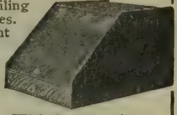

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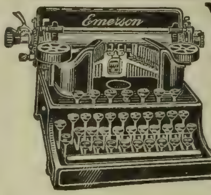

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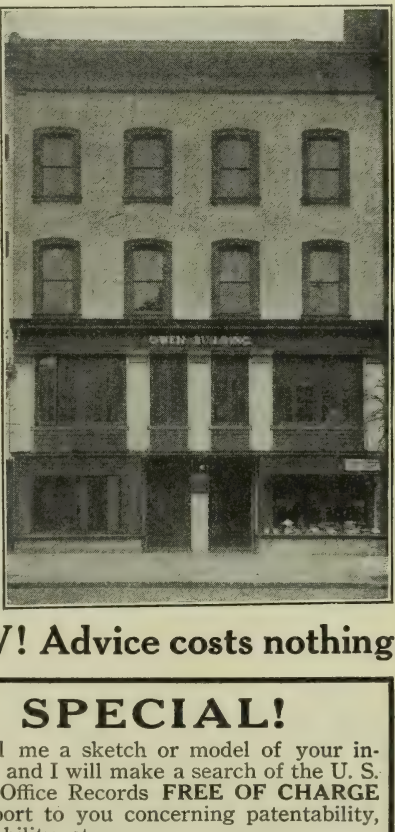

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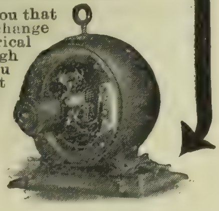

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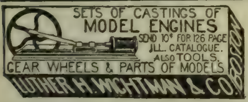

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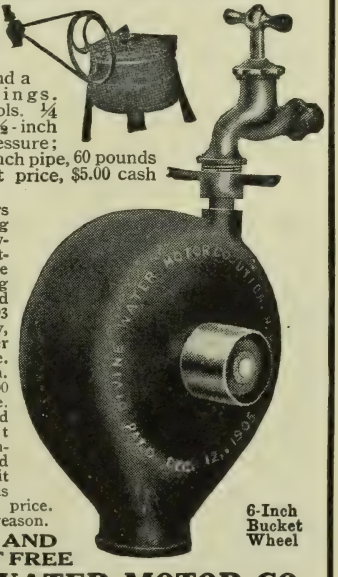

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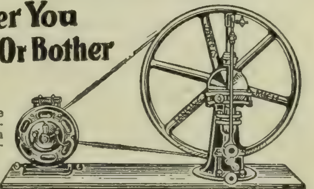

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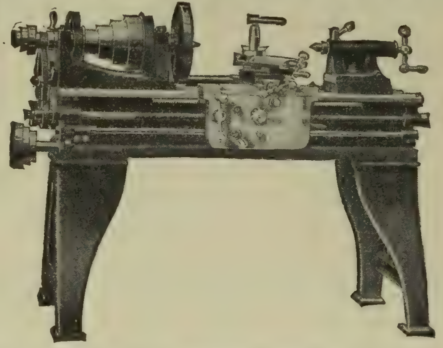

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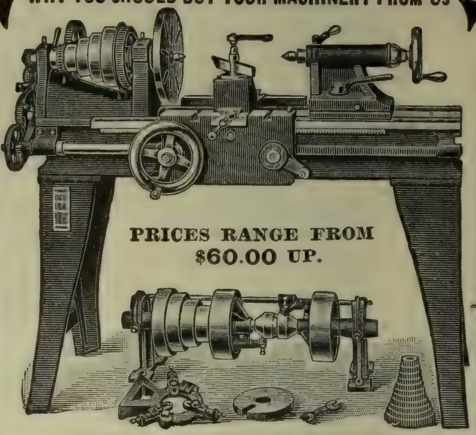

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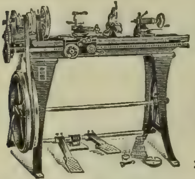

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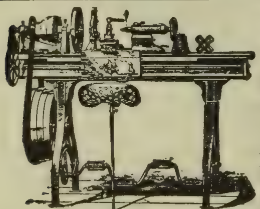

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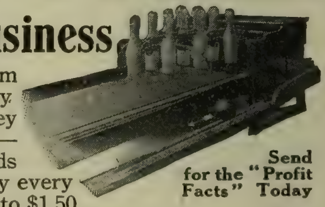

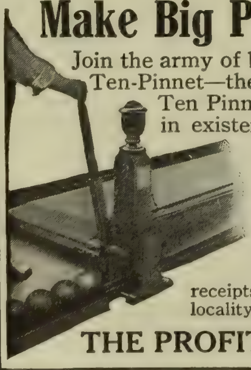

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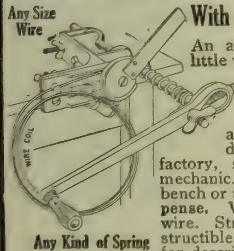

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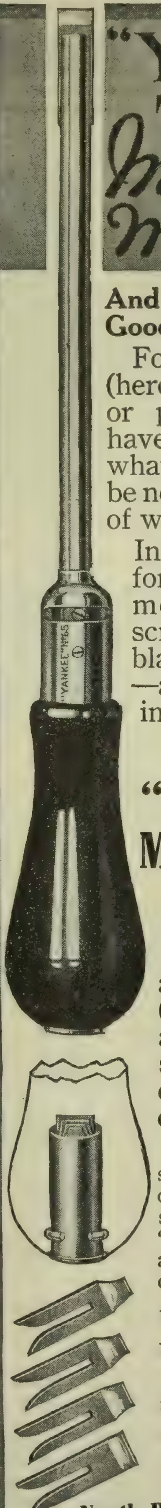

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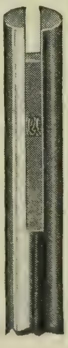

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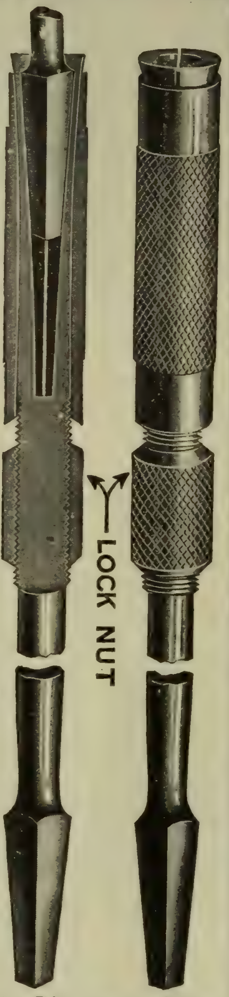

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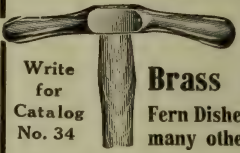

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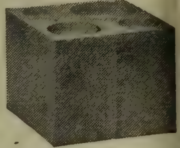
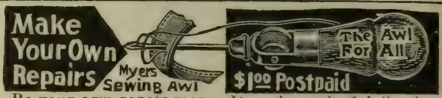


ORR & LOCKETT HARDWARE CO.
14-16 West Randolph Street, CHICAGO, ILLINOIS



Be your own repair man. Myers' wonderful Sewing Awl sews leather, canvas, shoes—anything, heavy or light. Speedy hand stitching Saves trips to town. Complete repair shop in itself Mends harness, saddles, wagon covers, blankets, buggy tops, belts, etc. Can't get out of order. Original and only awl with diamond point full grooved needle to protect the thread. *Big money for agents.*
C. A. MYERS COMPANY, 6339 Lexington Ave., Chicago

Portable Cases

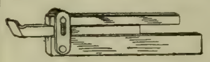
FOR TOOL MAKERS AND MACHINISTS

Twelve styles, felt lined drawers, solid brass trimmings, best of material, beautiful finish, low prices, satisfaction guaranteed. Ask for booklet of cases built for service.

The Pilliod Lumber Co.
SWANTON, OHIO

more important in this connection, she is quite obviously impregnable. We could, it is true, destroy her navy, bombard her ports, blockade her coasts—and by so doing create a position far more onerous for us than for her. She would be embarrassed, we should starve—Lancashire from lack of cotton, other parts of our population from high prices of food; our finances would be chaotic from the havoc which this state

SENT ON 30 DAYS' TRIAL TO RESPONSIBLE PERSON

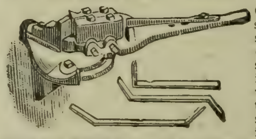


The Handiest Tool Holder Made

Constructed of hardened steel, well and truly made. Holds any shape of stock down to No. 60 Drill. Write for Catalog E.

B. MORGAN, Manufacturer of SPECIALTIES
Bellevue St., NEWPORT, R. I.

WE SHIP ON APPROVAL



Our Hand Power Angle Benders are so indispensable for bending rods, squares, and flat pieces into all sorts of angles that we do not hesitate to ship tools for 10 days free trial. Made in 3 sizes to cover a wide range of work. We also make hand power tools for bending eyes, hooks, "U" shapes, hinges, rings, etc. Write for complete descriptive catalogue.

WALLACE SUPPLY CO., 124 No. Jefferson St., Chicago; 26 Cortlandt St., New York City

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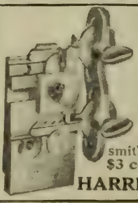


made in little over a minute by the
HARRISON M. I. P. KEY FILING MACHINE

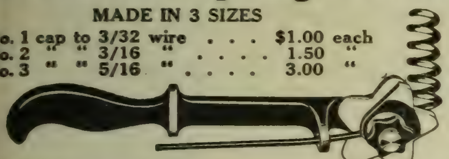
Yales, Corbins, Russell & Erwins, Norwalks, Readings, etc. The greatest invention of the age, price within the reach of the masses. Master Mechanics, Hardware Stores, Superintendent of Buildings, Locksmiths, etc., cannot afford to be without this tool. **Price $3 complete by mail free. Send for circular.**

HARRISON & CO., 81½ New Street, New York

Perfection Spring Winder

MADE IN 3 SIZES

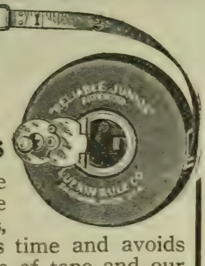
No. 1 cap to 3/32 wire . . . $1.00 each
No. 2 " " 3/16 " . . . . 1.50 "
No. 3 " " 5/16 " . . . . 3.00 "



The *only* Practical Spring Winder on the market. Makes springs any length, diameter or pitch, any gauge wire, flat or square stock. The only tool suitable for making right or left hand, extension, compression or torsion springs. Winds to last inch of stock. No waste. Should be in all garages and repair shops.

EDGAR T. WARD & SONS, SMALL TOOL DEPT.
23 Purchase St. BOSTON, MASS.

LUFKIN



Measuring Tapes

Standards of efficiency for the Amateur and the Expert. The big improvement in markings, **instantaneous readings,** saves time and avoids error. Send for sample piece of tape and our complete catalogue.

THE LUFKIN RULE CO.
SAGINAW, MICH.
New York London, Eng. Windsor, Can.

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of war would make with the British millions sunk in American investments; while America, a self-contained continent, would be much less seriously hit. She does not depend upon foreign food; the foreign money she has already secured; her foreign trade is but a drop in a bucket compared to her internal trade; she can far better afford to be locked in than we can afford to be locked out. Her navy serves no earthly purpose con-

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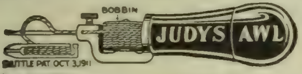
GASOLINE SOLDERING IRON BLOW TORCH

This is it. Have you seen it? Address Department 1.

EMMELMANN BROS. MFG. CO., INDIANAPOLIS, IND., U.S.A.

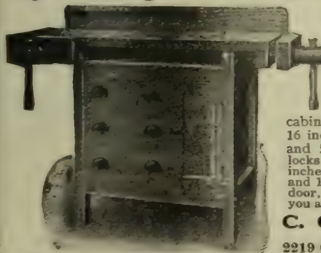
AGENTS—Make $30 per Week



This AWL sews a lock stitch like a machine. Best thing ever made for repairing Harness, Shoes, etc. A dozen exclusive features. Demand is immense. Sales astounding. Roy Sage writes, "Received Awl, sold 5 in 15 minutes." L. Perrine says, "Sold 9 on way home with sample." Low price, big profit, great value, quick sales. Drop everything; write for sample and instructions.

W. S. JUDY, Mgr. Dept. 1441, DAYTON, OHIO

By Getting a Work Bench Like This



you will be able to do most any kind of work around the house. The bench is 4½ ft. long, 22 inches wide and 32 inches high, made of hard maple, has 2 Patent Wood Screw Vises. The cabinet has three drawers, each 16 inches long, 18 inches wide and 5 inches deep, fitted with locks. The cupboard is 18 1-2 inches long, 18 1-4 inches high, and 10 inches wide, with lock on door, and will be shipped you at once on receipt of **$14**

C. CHRISTIANSEN
MANUFACTURER
2219 Grand Ave., CHICAGO, ILL.

"The Best Hack-Saw Blades in the Shop!"

Simonds Hack-Saw blades have become the standard in many shops because they will outcut, outwear any other blade.

Simonds Hack-Saws

(Pronounced Si-monds)

are naturally flat—due to our tempering process—hence the strains are uniform throughout the saw and it cuts freer, runs easier and with less power, and wears longer.

The size, slant and set of the teeth are scientifically and practically correct. They cut clean and fast and remove the least amount of metal. We guarantee 10% more work from a Simonds than you can get from any other blade. If you use blades in a power machine, here's the way we prove it—

Free Trial Offer

We will send you some blades. Test them against any others either by timing cuts with a watch or counting the strokes needed to cut through the same bar. Then see how many cuts each blade will make before it is worn out.

The reason for this superiority is our Simonds Special Crucible Steel, which we make ourselves for this particular work.

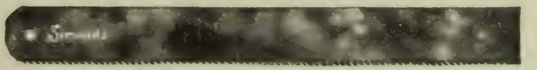
Simonds Files were awarded the Gold Medal at the Alaska-Yukon Exposition. Simonds Crescent Ground Cross-Cut Saws have more than double the sale of any other make. We make all kinds of saws and wood-working machine knives.

Ask your dealer or write us direct

Send for Book, "The Carpenter's Guide"

Simonds Mfg. Co. Founded 1832 **Fitchburg, Mass.**

Chicago	Portland	San Francisco	New Orleans
New York	Seattle	Montreal	Lockport, N. Y.



A Gift to make his Razor behave

is a Pike Strop-Hone. Just think what it means to actually lighten his daily burden of shaving. With a Pike Strop-Hone every shaver can get that same keen, silky edge that makes the barber's razor glide so easily and smoothly—*and it takes hardly a second.* The hone works beautifully—and the strop takes right hold. Costs but a dollar—combines a hone and strop at the price of one—and is good for both safety and old-style razors. This is one of the famous

PIKE SHARPENING STONES

"The only line that includes every sharpening substance—natural or artificial—each the best for some sharpening need."

There are Pike Stones for the home, shop and farm—inexpensive and best of all *practical* Christmas gifts for both men and women.

Do some of your Christmas Buying at your Hardware Store

Ask your dealer to show you the dandy Pike India Kantbreak Knife Sharpener (35 cents) and the Pike India Combination Oilstone ($1.00)—or send to us direct.

PIKE STROP-HONE $1.00

A Pike Stone FREE

Let us mail you our Pike India Vest Pocket Stone, for pocket knives, office use, etc.—just to show you how easy it is to sharpen with Pike stones. Merely send your dealer's name and 4c. for packing and mailing. With this we include "HOW TO SHARPEN"—the most complete booklet ever written on how to put a good edge on tools, knives, etc., and how to select and care for oilstones. You'll be pleased. *Write us today.*

PIKE MANUFACTURING CO.
101 Main Street . Pike, N. H.

Tool Cases for Machinists & Toolmakers

You need one of the many styles shown in our free catalogue. They are the best built and most practical on the market and it's the up-to-date way to keep tools in good condition and orderly arranged. We ship direct to you and guarantee complete satisfaction.

H. Gerstner & Sons.
DAYTON OHIO
Mfrs. of Mechanics' High Grade Tool Cases
818 Germantown Street, DAYTON, OHIO

nected with any vital function of her national life; by bombarding her coast towns we could do some damage (not much, as all bombardments prove) to property which is mainly ours, and which in the end our insurance companies would have to pay for.

"But beyond that—nothing.

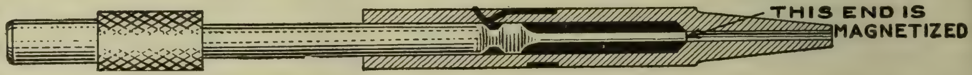
"There we should stick. If we landed armies they would be swallowed up in the very spaces of the continent."

◆ ◆ ◆

About one tree in each 20 planted lives to maturity.

THE EXCELSIOR BRAD SET. PRICE 25 CENTS

Takes No. 18 and No. 20 Brads from ¼ to ¾ in. long



The tool illustrated above will be indispensable to the Pattern Maker, Cabinet Maker, or Picture Framer who purchases it. It will set brads in places that would be inaccessible without it, and dispenses with the brad awl and nail set. If, after a fair trial, you are not satisfied that you have received your quarter's worth, your money will be promptly returned to you on receipt of tool. **Standard Tool Supply Co., 42 W. 15th St., New York City**

YOUR BOY and a WORK BENCH

The Christmas gift problem is again at hand. Buy your boy a good "Home Bench" and have the matter of "His" present settled. A

Grand Rapids Home Bench

will please him and at the same time be of inestimable value in teaching him the principles of industry and self-reliance. Just the thing for the long winter evenings.

This Bench is built from Hard Maple with top having the double tongue and groove joint construction. It is 56 inches long, 32 inches high, 20 inches wide and furnished with or without cupboard. Wood Screw or Rapid Acting Vises.

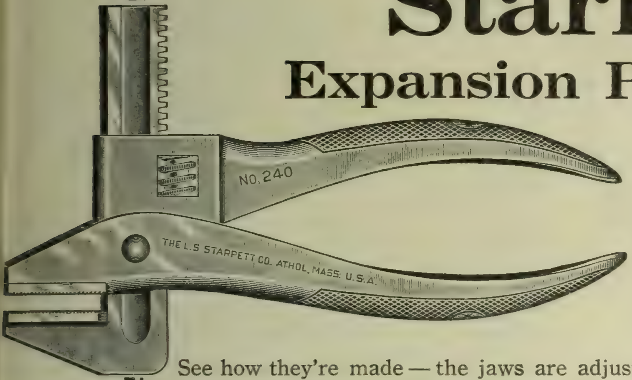
No. 99
Drawers fitted with locks

Our catalog gives complete information regarding this and other Home Benches. Write for copy.

GRAND RAPIDS HAND SCREW CO.
1620 Front Ave., N. W. GRAND RAPIDS, MICH.

If you want one of our Stone Blotters send 15c when writing for catalog

When Other Pliers Won't
Starrett
Expansion Pliers Will


NO. 240
THE L.S. STARRETT CO. ATHOL, MASS. U.S.A.

WILL WHAT?

Pull out that headless nail.
Start that rusted nut.
Loosen that stubborn bolt.
Do a hundred "mean" jobs
when other tools won't.

See how they're made — the jaws are adjustable, and automatically fit the work. The fulcrum is short, giving tremendous squeeze. The handles are always right distance apart to grip with the hand. See them at your dealers.

Send for Catalog 19 A. P.

The L. S. Starrett Co., Athol, Mass.

NEW YORK **LONDON** **CHICAGO**

42-5

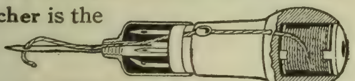
ALBINISM IS EVERYWHERE—An albino is a person or animal with the absence of color in the hair or eyes, or both. This is also found in many birds, and it is not very uncommon to see or hear of a white blackbird, or a white crow, or some other bird or fowl which is very highly colored in its natural state.

No people are as frequently albino as the Arizona Zuni Indians, who are very frequently white-haired and pink-eyed.

It is asserted that this results from the absence of coloring matter. In all the animal kingdom this condition seems to exist.

Certain fowls show the same condition. A number of

FOR SEWING LEATHER



The **Speedy Stitcher** is the latest and best of anything ever offered for $1.00.

Agents make over 200% profits.

Send at once for catalog and terms.

AUTOMATIC AWL CO., 26 Gardner Terrace, WORCESTER, MASS.

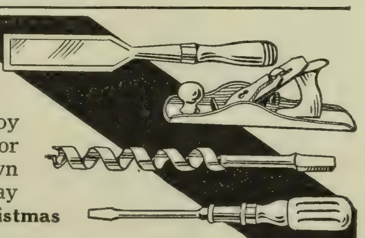
Bonded for 2 Years

ACTUALLY COVERED BY A BOND

Yes, It's a New "Red Devil" drop forged steel plier, made so perfect that we issue a guarantee bond with it to replace it any time within two years should it be found defective in **any respect**. It's an insured tool. It's a side cutter you should insist on buying. Ask your hardware man for "**Red Devil**" No. 1650 and "**Bonded Plier.**" Look for the "**Red Devil**" stamp "**Bonded.**" Examine the bond packed with each tool. You never bought a tool so guaranteed in your life. If your local dealer can't supply you, send us $1.75 for **one** only sample pair.

SMITH & HEMENWAY CO. **051 Chambers Street NEW YORK, U. S. A.**

A GOOD HOME BENCH AND GOOD TOOLS



afford profitable occupation for the boy who is taking Manual Training as well as for the man around the house. The bench shown here is only one of our styles — others may suit you better. **They make ideal Christmas Presents.**

"OHIO" TOOLS

are carefully made throughout by skilled workmen, treated and tempered by the most improved methods, and are known to particular tool users as the best in the market — **fully warranted.**

Insist on this trade mark when buying Planes, Chisels, Drawing Knives, Auger Bits, Screw Drivers, etc.

Write for our free Catalogue

OHIO TOOL CO. (Dept. 3)
COLUMBUS, OHIO

W

Set up your own tree

On top place the

"Vulcan"

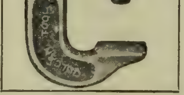
Superior Drop-forged Tools

Every "Vulcan" is something better than before existed and the best "Christmas Gifts" to yourself are tools that will increase your earning capacity and give you a life-time of service. The free, just out, pocket size tool catalogue will assuredly interest you. Your dealer carries our products—just say "Vulcan."

J. H. WILLIAMS & CO.
Superior Drop-forgings
47 Richards St., BROOKLYN, N. Y.

"Vulcan" Machinists' Clamp

Easy and rapid adjustment—knurled screw. Special treatment prevents springing.



"Vulcan" Toolmakers' Clamp

First dependable, small Clamp ever offered. Development of our own practices.

MAKE YOUR BIKE A MOTORCYCLE

at a small cost, by using our attachable outfit. Fits any Bicycle. Easily attached. No special tools required.

9380 Miles Repair Bill $1.55

Mr. Hunt, of Washington, writes: "Just a word of praise for your wonderful attachment. I rode machine up-to-date 9380 miles. My repairs have been only $1.25 for new belt and 30c for new idler axle. I have had no trouble whatever. I strongly recommend your attachment to anybody desiring a simple, substantial motorcycle."

FREE BOOK Write today for bargain list and free booklet, fully describing the SHAW Bicycle Motor Attachment. Motorcycles all makes, new and second-hand, $35.00 up.

SHAW MANUFACTURING CO.
Dept. 6 GALESBURG, KANSAS

$40 Motorcycle

We have the largest line of new and used Motorcyles in the country at the lowest prices. We also have a thoroughly equipped repair department and are in position to furnish repairs for any machine. Send us your machine to be overhauled. We pay cash for second hand motorcycles. *Send for Catalog.*

HARRY R. GEER CO., 888 McLaran Ave., ST. LOUIS, MO.

prairie chickens have been shot that were perfect albinos.

A few robins and English sparrows, and occasionally a white redbird, are found in different parts of the country, and they are always looked upon as remarkable freaks in nature, but are in fact quite common.

Some florists declare albinos exist among flowers, and that white specimens come in many flowers that are naturally of high colors.—Cleveland Plain Dealer.

CLAMPS

This cut shows the **Ducharme Patent Universal Clamp** glueing two blocks of wood together and the advantage of the clamp setting upright on the bench so that there is no strain on the wood that is being glued together. The CLAMPS are also used for bevel work or can be used as parallels. Write for circular C and price lists.

MANUFACTURED BY
The Ducharme Machine Co.
389 Riverside Ave., Medford, Mass.

A Hack Saw That Anyone Can Use

Star Hack Saw Frames are light and easily handled, yet strong and durable. The reinforced centre gives strength where most needed.

STAR HACK SAW FRAME No. 10
WHEN USED WITH
STAR HACK SAW BLADES

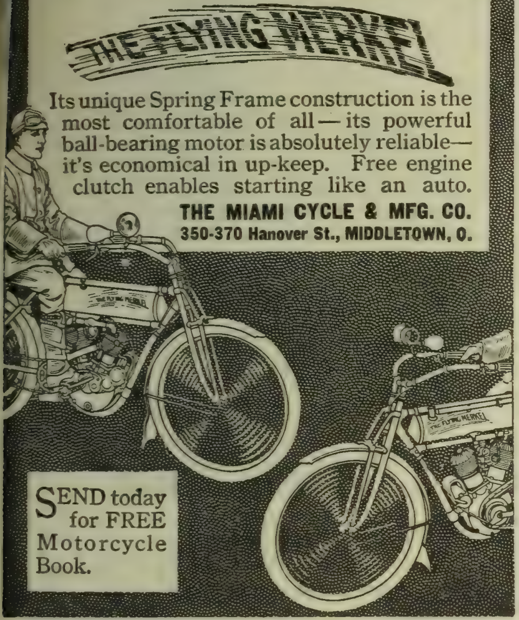
is a tool of real efficiency. The frame is adjustable—holds blades 6 to 12 inches long. Star Hack Saw Blades cut clean, easy and quick and last long. Experienced mechanics have used them for twenty-five years.

The price of Star Hack Saw Frame No. 10 is $1.00. Star Blades, 12 inches in length, cost 50 cents per dozen. Look for the (★) Star.

MILLERS FALLS CO., 28 Warren St., NEW YORK CITY

"TOOL PRACTICE"
—an instructive
booklet—sent
FREE

Combine Business with Pleasure. There's a heap of satisfaction in riding



Its unique Spring Frame construction is the most comfortable of all—its powerful ball-bearing motor is absolutely reliable—it's economical in up-keep. Free engine clutch enables starting like an auto.

THE MIAMI CYCLE & MFG. CO.
350-370 Hanover St., MIDDLETOWN, O.

SEND today for FREE Motorcycle Book.

Convert Your Bicycle into a Motor-Cycle using our Attachable Outfit. Fits any wheel. Also Marine and Stationary Motors and Finished Castings. Stamp for catalog. **STEFFEY MFG. CO.,** Girard Ave. and 30th St., PHILADELPHIA. PA.

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We Make the Price

To get our latest book EREE, give name of your motorcycle. This is the most complete exclusive motorcycle accessory catalog ever published. You can't afford to be without it. Address us today.

Motorcycle Supply Department
Kansas City Automobile Supply Co.
1501 Grand Ave., Kansas City, Mo.

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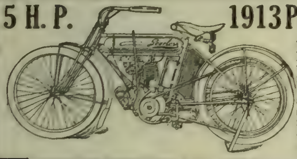
5 H. P. 1913 Peerless Motorcycle



With Free Engine Idler and Bosch Magneto, together with the best there is in motorcycle construction---Power, Silence, Endurance, and those Wearing Qualities so essential for low cost of maintenance.

5 MILES FOR ONE CENT

Agents Wanted—Liberal Discounts

PEERLESS MOTORCYCLE CO., 179 Huntington Ave., BOSTON, MASS.

We Ship on Approval

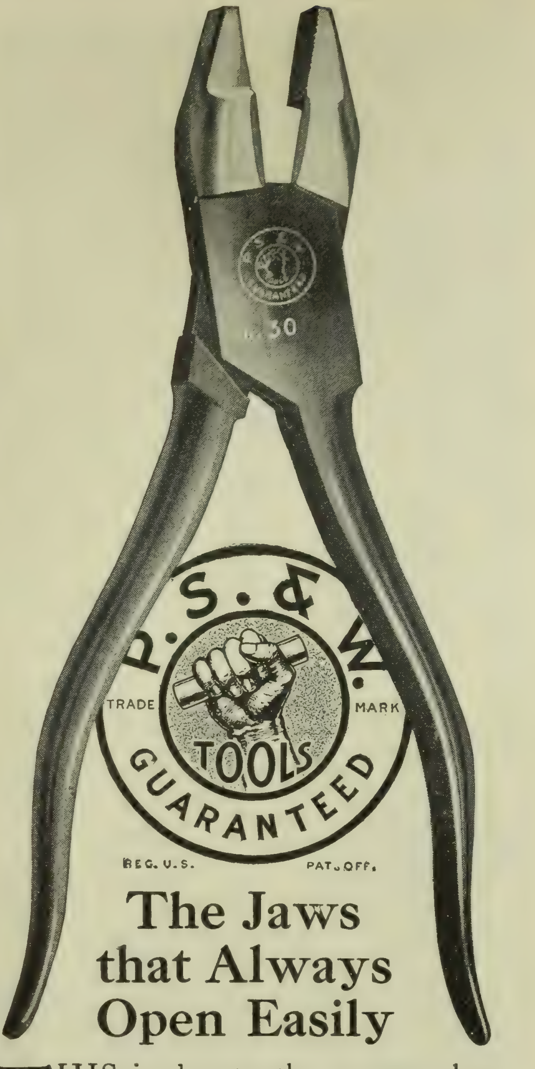
without a cent deposit, prepay the freight and allow **10 DAYS FREE TRIAL** on every bicycle. **IT ONLY COSTS** one cent to learn our *unheard of prices* and *marvelous offers* on highest grade 1913 models.

FACTORY PRICES *Do not buy* a **bicycle** or a pair of **tires** from *anyone* at *any price* until you write for our new large **Art Catalog** and learn our *wonderful proposition* on the first sample bicycle going to your town.

RIDER AGENTS everywhere are making big money exhibiting and selling our bicycles. **We Sell** cheaper than any other factory.

TIRES, Coaster-Brake rear wheels, lamps, repairs and sundries at *half usual prices*. **Do Not Wait;** write *today* for our *latest special offer* on "Ranger" bicycle.

MEAD CYCLE CO. Dept. G 108 CHICAGO



The Jaws that Always Open Easily

THIS is due to the accurate box-joint construction and careful fitting, and is among many advantages that put the P. S. & W. No. 30 Plier head and shoulders above any other plier ever made.

Good steel, individual tempering, careful milling of the jaws, fine finish, and the perfectly working box-joint are without rivals.

Top-notcher of the largest line of box-joint and lap-joint pliers manufactured.

The 170-page "Mechanics' Handy List" describes over 200 hand-tools for Electricians, Tinsmiths, Machinists and Carpenters, and contains 35 pages of reference tables and valuable information. Send for it.

THE PECK, STOW & WILCOX CO.
MFRS. of the Largest Line of Mechanics' Hand-Tools Offered by Any Maker
SOUTHINGTON, CONN. NEW YORK, N.Y. CLEVELAND, OHIO
Address 20 Murray St., New York City

Signal Flannel Shirts—
For Fall and Winter Comfort

FOR outdoor and indoor wear, no shirt is as warm, comfortable, strong and durable, neat or well-fitted as a **Signal Flannel Shirt.** Comes with "lay-down" or military collar in all colors and several weights, with useful, roomy flap, scout, or plain pockets. Made for *long wear* and *real service.* Up to the Signal high standard in quality—and down to Signal value in price. You can buy a Signal Flannel

For $1.00 to $3.00 **You Can't Beat The Price You Can't Equal The Shirt**

For dress wear we've made a **Detachable-Collar Flannel Shirt** with handy pockets and dressy double French cuffs. Wear it with the Flannel or regular white collar. Made up in many snappy patterns and coat style. They sell for $1.50 and $2.00.

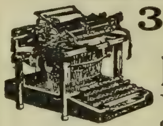
Union Made

SIGNAL SHIRT

Trade Mark
The Mark of "Quality"

Ask Your Dealer
to show you the new line of
SIGNAL FLANNEL SHIRTS
Be sure to see the Signal Trade-Mark.
Also makers of Signal Work Shirts and Overalls.

Hilker-Wiechers Mfg. Co.
1256 Mound Ave., - - - Racine, Wis.

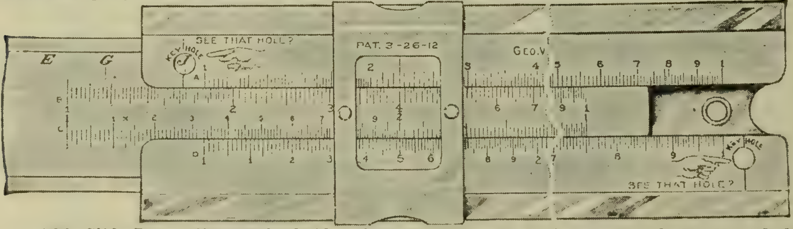


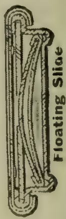
3 PENNIES A DAY
One Dollar a Month
Buys a Standard Typewriter
Your choice, Remington, Oliver or Smith Premier. Prices lower than other cash prices. Perfect machines only — guaranteed.
TYPEWRITER INSTALLMENT CO.
P 180 N. Dearborn St., CHICAGO

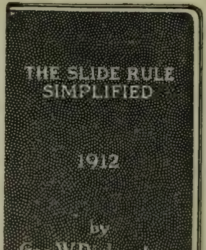
WHERE RENT IS ONE DOLLAR PER MONTH—Common laborers, in Mexico are paid from 31 to 37 cents a day. They live in houses built of adobe, having but one room and that windowless, and a small back yard, or corral. These houses rent as low as one dollar a month. They are absolutely without any conveniences, having a dirt floor and are nothing more than mere shelters. Even the homes of the rich are without cooking stoves. There are only a few stoves in use in Mexico, and these are mainly in the homes of foreigners.

THE MAN BEHIND **in his calculations finds in the Richardson Slide Rule the desired answer**

There seems to be a misunderstanding about what the Slide Rule will accomplish, many think it an instrument, the use of which is appliable **only** to Engineers and Technical men. So frequently have I heard this remark that I have completely re-written and enlarged my instruction book, which shows the actual setting of the rule by **78 full size engravings,** each engraving and example is explained and "written so you can understand it." In fact any person who has never seen a Slide Rule, and not a technical person, could not help but learn its use. The examples selected and shown by illustrations are those which frequently come up for solution by the **Banker, Broker, Auditor, Inventory Man, Cost Estimator, Printer, Paper Mfr., Contractor, Salesman, Time-Keeper, Bookkeeper, Lumber, Land,** and **other merchants** too numerous to mention.







This Slide Rule will multiply, divide, solve proportion, extract the square and cube roots, find the decimal equivalent of vulgar fractions or "vice versa," calculate interest, percentage. Also the mensuration of superficies, and the rule of three. For Engineers, Electricians, Draftsmen, Superintendents, Master Mechanics, etc., the rule is indispensable in their work. It is one of the most valuable instruments ever offered to mankind. For Electricians it is a complete wire table in itself, calculates the size of a motor to run a pump, shows percentage a customer's recording meter is either "slow or fast." The Richardson Direct Reading Slide Rule is specially designed for those who wish to learn its use. Its operation being very simple. You simply place the key to the problem wanted in the keyhole (the key is printed in red on slide, see cut) and answer is given direct: such as the Horse Power of Engines, Pumps, Boilers, Belts, Water Falls; size of duct for ventilating; radiation and size grate, and steam main required; change gear and pulley problems; areas, circumference and diameter of circles. This Rule is my 1912 type now being placed on the market for the first time. Made in **two** sizes, **coat** and **vest** pocket 11x1⅝x¼ and 5¾x1⅜x⅛. No **wood** in their construction, scales white celluloid, printed from **engine divided** plates in two colors, and **washable,** secured by an improved locking device in an absolutely non-corrodible **Aluminum** and **Monel Metal** framing. Durable cardboard case for large rule, and neat **leather** case for **vest pocket** size. Special case for large rule end-flap and button fastening 25c extra. Full leather case 50c. **If ordered now** I give **free** a copy of my new book **The Slide Rule Simplified.** Price of either above rules **$2.50. A limited** number **10 inch Student** Rules with cardboard scales **Given Free** to each purchaser of **above book.** Price of book without rule, paper cover $1.00. Flexible silk cover $1.50. **GEO. W. RICHARDSON, Consulting Engineer, Ex-Chief Electrician, U. S. Navy, 4218 24th Pl., Chicago, U. S. A.**

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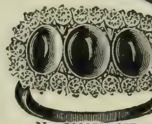
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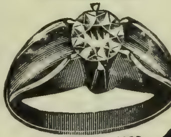
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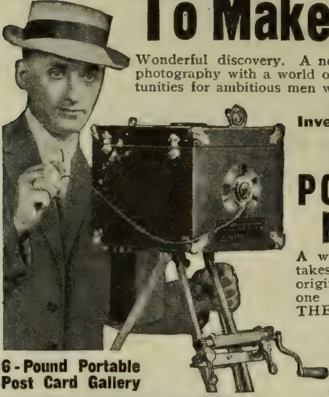

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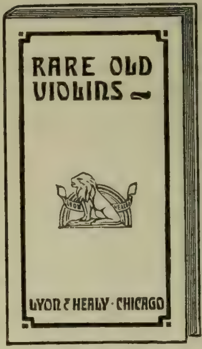

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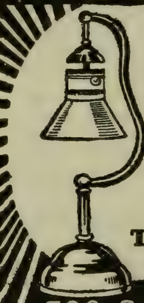

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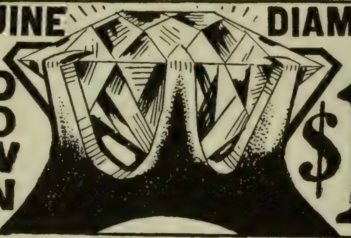

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from the inscription, it is more probable that the Roman emperor Trajan (98 or 117 A. D.) erected this structure. The inscription also mentions the name of Servius Supus of Lusitania as the architect. The tower is built of ashlars and is nine meters square and forty meters in height. It has six separate stories, which can only be reached by a circular staircase around the exterior of the tower. The lighthouse was restored in 1684, but at the end of the eighteenth century was again in ruins. In 1797 it was rebuilt by the Spanish government, and still sends forth its beams.—Argonaut.

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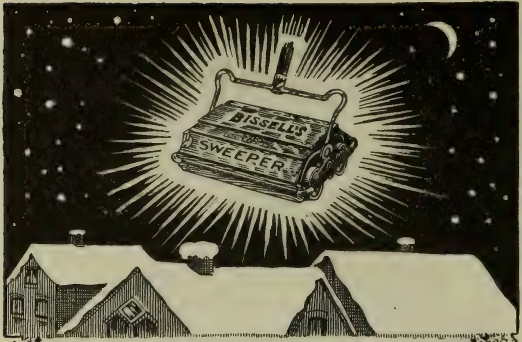

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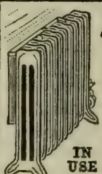

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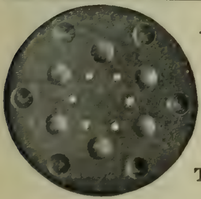

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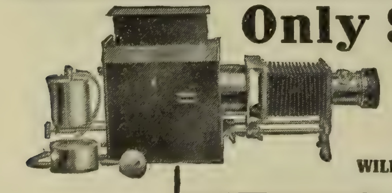

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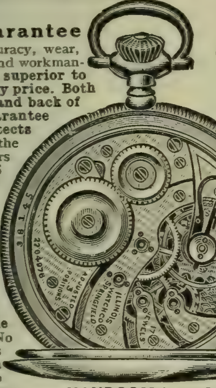

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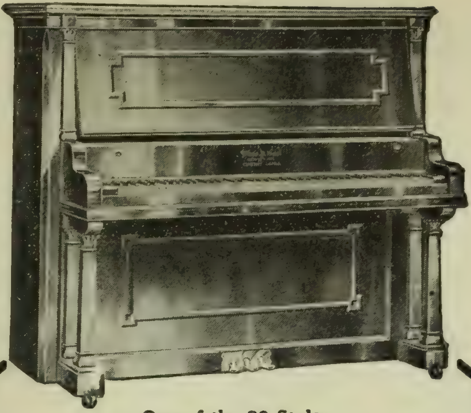

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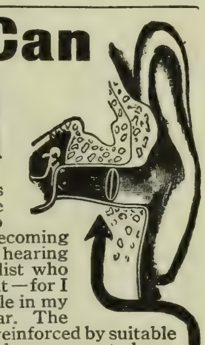


distinctly every sound—even whispers do not escape them when they are properly assisted. Deafness is due to the ear drums from some cause becoming defective. I offer you the same hope of hearing as you have of seeing from the oculist who supplies glasses to help your eyesight—for I apply the same common sense principle in my method of assisting the deaf to hear. The weakened or impaired parts must be reinforced by suitable devices to supply what is lacking and necessary to hear. Among the 390,000 people who have been enabled to hear perfectly there has been every condition of deafness or defective hearing. No matter what the cause or how long standing the case the testimonials sent me show marvelous results.

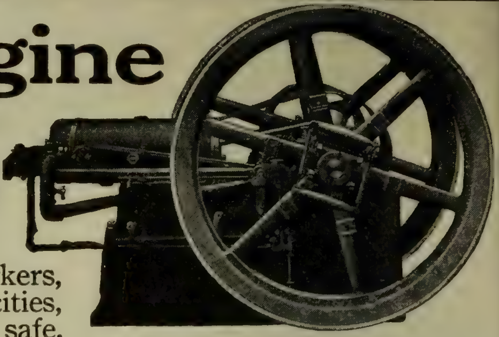
Common-Sense Ear Drums

wonderfully assisted my own hearing—that's how I happened to discover the secret of their success in my own desperate endeavors to be relieved of my deafness after physicians had repeatedly failed.

Common-Sense Ear Drums are made of a soft, sensitized material, comfortable and safe to wear. They are out of sight when worn, and easily adjusted by the wearer.

It is certainly worth your while to investigate. Before you spend any money just drop me a line. I want to send you *free of charge* my book on deafness and plenty of evidence to prove to you that I am entirely worthy of your confidence. Why not write me today?

GEORGE H. WILSON, President
WILSON EAR DRUM CO., Incorporated, 717 Todd Bldg., Louisville, Ky.



An I H C Engine

Will Do Your Hardest Work

An I H C oil or gas engine furnishes the most satisfactory power for running model-making machinery, machines for confectioners, bakers, plumbers, laundries, printing offices, tin and sheet metal workers, and for all the various industries of cities, towns and farms. The power is steady, safe, reliable, and inexpensive. The engine can be started and stopped with the work, so that there is no waste of power or fuel. The first cost is very reasonable.

I H C Oil and Gas Engines

are made in all sizes, from 1 to 50-horse power, and every engine is thoroughly tested before shipment. They are made in all styles—horizontal and vertical, air and water-cooled, portable, stationary, and mounted on skids. They operate on gas, gasoline, kerosene, naphtha, or alcohol, using whichever fuel is cheapest or most convenient for you. You can save money, time and trouble by installing an I H C engine to do your work.

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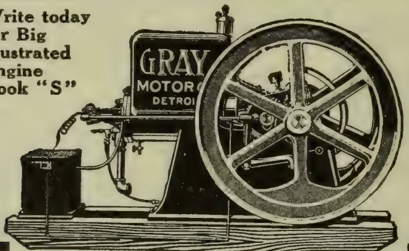
INTERNATIONAL HARVESTER COMPANY OF AMERICA
(Incorporated)
16 Harvester Building CHICAGO, U S A



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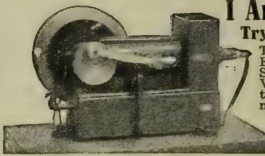
POWER FOR THE FARM, SHOP AND COUNTRY HOME

Complete ready to run—fuel tank in base—water cooled—wonderful economy, uses Kerosene or Gasoline —12 sizes, 1½ to 36 H. P. 30 DAYS TRIAL.

GRAY MOTOR CO., 1299 G.M.C. Bldg., Detroit, Mich.

"CLOTHESPOLE JACK"—"Any lines put up? Any lines put up?" This is the familiar call in the more thickly tenanted sections of Manhattan.

More prosaic and less spectacular than the climbing of the "steeplejack" the "clothespole jack's" labors net him correspondingly less. Nevertheless, he gets a good price for a few minutes of climbing. In the poorer districts one can get a line put up for a dime or a nickel, but in the better districts the prices range from

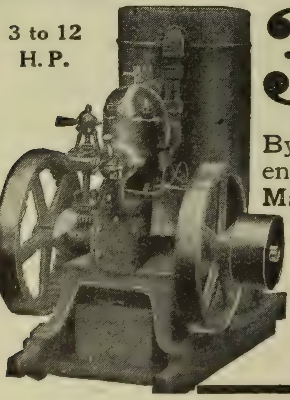


I Am Yours for $19.50

Try me for 10 days

This is our 1-2 horse power Gasoline Engine fully equipped. Switch, Coil, Spark Plug. Gasoline Tank, Mixing Valve all ready to run. Fully Guaranteed. Return if not satisfactory and money refunded. Will run Washing Machines, Cream Separators, Butter Churns, or any light machinery where small power is required. **Inclose 2c stamp for reply.**

SIEVERKROPP ENGINE CO., 1224 18th St., Racine, Wis., U.S.A.



3 to 12 H. P.

34c Runs this 6 H. P. Engine for a 10 hour day on KEROSENE

By means of the patent throttle you can run it as a 4 H. P. engine **for 23 cents a day,** or as a 2 H. P. **for 12 cents a day.** Many other strong points; force-feed lubrication; uniform speed; sight-feed fuel supply; automobile muffler; no cranking; runs either way; uses any fuel oil satisfactorily. And it's **Guaranteed for 10 Years.** Write for catalogue and 30 days' free trial.

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ELLIS ENGINE CO., 65 Mullett St., Detroit, Mich.

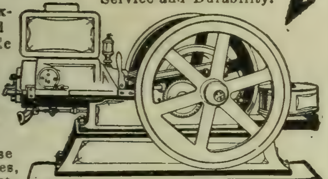
Cheaper Power for Every Purpose

The **WATERLOO BOY GASOLINE ENGINE** will run all day without attention, furnish exactly the power you need, maintain a uniform speed and save you money every hour it works. Uses either **Kerosene or Gasoline for fuel—equipped for both at no extra charge**

The recent award of **Gold Medal** at Budapest, Hungary, *in open competition with the best engines of all countries* is clinching proof that the **Waterloo Boy leads the World** in Construction, Power, Service and Durability.

Has many important exclusive features—Speed Lever works like throttle on a locomotive; old reliable fly ball governor, automatic feed regulation, open jacket, starts easy in Winter, interchangeable parts, etc.

Lowest in price because made in largest quantities, at low manufacturing cost. *Guaranteed 5 Years.* Book free. Write today.



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Awarded Gold Medal, First Prize at the International Gasoline & Oil Engine Show Budapest, Hungary

$50 to $300 SAVED

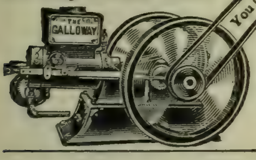
We are manufacturers, not merchants. Save dealers', jobbers' and catalog house profit. 10 or more men in every township can save $50 to $300 on my High Grade Standard Gasoline Engines from 1½ to 15 H-P, price direct to you lower than dealers or jobbers pay for similar engines in carload lots for spot cash.

GALLOWAY

Price and quality speak for themselves and you are to be the sole judge. Sell your poorest horse and buy on

30 Days Free Trial

You Can Make From $5 to $10 a Day



Direct From My Factory Satisfaction or Money Back

Write for special proposition to 10 or more men. Send for my big BOOK FREE.

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1965 Galloway Station
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a quarter up. A quarter pays only for putting in a line. If a pulley is attached it is a dime extra. If any extra trying is to be done it means another dime, and sometimes another quarter is added. An enterprising "clothespole jack" sometimes will put up 20 or 30 lines a day, and so get from $5 to $7.50.—New York World.

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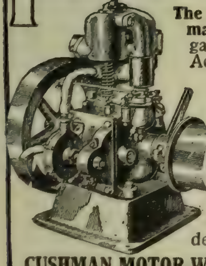
Designed for military purposes, a cart invented in England can be used as a water carrier, fire escape, trestle bridge, or ambulance.

POWER For all Purposes



The High Powered, Light Weight Cushman Engine measures out just enough gasoline to do the work required. Advanced 4 cycle type. Weight under 200 lbs. 4 h. p. rating but actually develops over 5 h. p.

AUTOMATIC THROTTLE GOVERNOR WITH HIGH GRADE SCHEBLER CARBURETOR

Easy speed changes, special friction clutch pulley. Also new 6-8 and 20 h. p. high efficiency engines for heavy work. Now ready. Free book describes all. Write for it.

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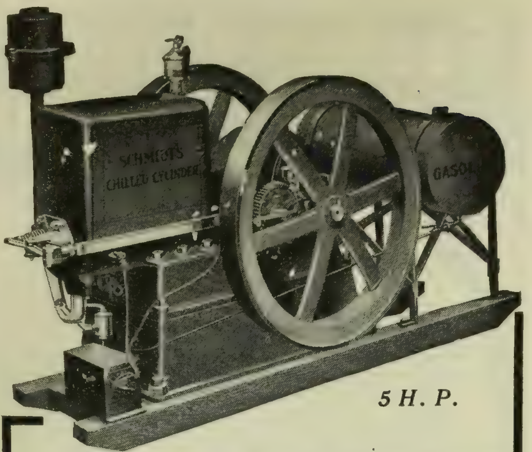

5 H. P.

$7.50 And You Keep This Great Engine

We will ship you any one of Schmidt's Chilled Cylinder Gasoline Engines for a 10 days free trial. Your choice of sizes, horizontal or upright, water cooled or air cooled. Then, if you don't want it send it back at our expense. If you wish to keep it, pay as low as **$7.50 and you can pay rest in easiest monthly payments.** You get the engine at the Rock Bottom Price—the same price that even the wholesale dealer has to pay. Send coupon or a postal card for full particulars.

Ten Days' Trial FREE

Think of it. You may try out a genuine Schmidt's Chilled Cylinder Gasoline Engine on your own place for 10 full days absolutely **FREE.** We want you to see for yourself the wonderful Chilled Cylinder, Ben Schmidt's new oiling device, the valveless carburetor and the other exclusive features that make Schmidt's Chilled Cylinder engines the simplest and most efficient engines in the world. Your choice of sizes—horizontal or upright—water cooled or air cooled.

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We carry a complete line of engine accessories—pulleys, shafting, belts, pumpjacks, sawing outfits, washing machines, feed grinders, etc. You may have your choice of any of them at the rock bottom price. Pay for them on the easiest kind of payments. Send the free coupon for catalog.

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If you like the engine after trying it out for 10 whole days keep it and take a long time to pay for it on easy monthly payments. You pay only the rock bottom price **—the same price that even the wholesale dealer must pay.** Schmidt's Chilled Cylinder Gasoline Engines are absolutely guaranteed five years. The biggest bank in Iowa backs our $1000 challenge offer.

Send the Free Coupon for Ben Schmidt's Book Just put your name and address on the free coupon and we will send you Ben Schmidt's new book "How to Use Power." Tells you about gasoline engines and their uses—gives many pointers that you should have. We will also tell you all about our wonderful offer and about Schmidt's Chilled Cylinder Gasoline Engines. Do not delay. Send the free coupon today—now—immediately while this offer lasts.

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Factory Prices for the Asking on Genuine Witte Engines

FREE Engine Book

THE genuine Witte—conceded the best farm engine in America—now offered at actual wholesale prices. Yes, this is the engine that has led the gasoline engine field for 25 years. Dealers have been getting the highest prices for the Witte. *Now* you can get one at actual factory price—what the dealer paid—and have the finest engine in your county.

Our Gas Well Saves You Many Dollars More

We do more than give you ordinary factory prices. We are the *only* manufacturers who have our own gas well. Power, testing, forge, foundry and heating fuels cost us nothing. *You* get the benefits. But you couldn't afford to own any other engine even if the Witte cost twice as much—because an average of 1 cent for every horse-power per hour *cuts gasoline bills in half*—pays for your engine in no time. Every part *guaranteed* 5 years—*full rated horse power on minimum gasoline* guaranteed too. Built in all sizes from 1½ to 40 h. p., every one *tested to 10% overload.*

WRITE FOR 60 DAYS FREE TRIAL OFFER and complete, direct, factory price proposition with catalog and special offer bulletin. We expose engine secrets in this bulletin that will startle you. Remember, it's your first chance at an engine of quality, standing and reputation at a small price. Mention size needed or work to be done.

Every Part Guaranteed 5 Years

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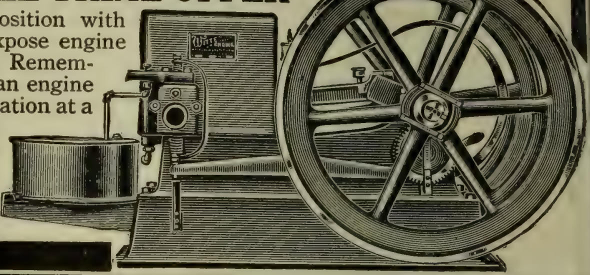
WITTE IRON WORKS CO.
1742 Oakland Ave., Kansas City, Mo.



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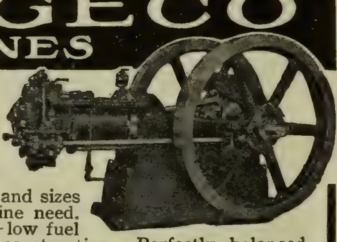

1½ to 350 H. P.
Gas, Gasoline, Oil and Producer Gas

Includes all types and sizes to meet every engine need. Simple to operate—low fuel cost—substantial construction. Perfectly balanced, smooth, steady, reliable. Sales branches and stocks everywhere. If you expect to buy an engine our expert will tell you what is best and cheapest for you.

INGECO ENGINES **INTERNATIONAL GAS ENGINE CO.,**
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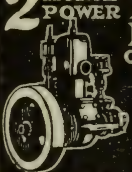
CONCRETE APPLES—A surprising result of the use of cement has been discovered by a New Jersey farmer, according to the always truthful daily press. This farmer had read somewhere that all that was necessary to arrest decay in fruit trees was to cut out the rotten part and fill the cavity with cement mortar. One of his pet apple trees was languishing away, and its crop yearly diminishing, so he decided to put his knowledge into effect. A large quantity of cement

2 HORSE POWER AMERICAN MARINE MOTORS $38 COMPLETE



OTHER SIZES 2 TO 20 HORSEPOWER PROPORTIONATELY LOW PRICES

GUARANTEED FOR LIFE.
AGENTS WANTED.

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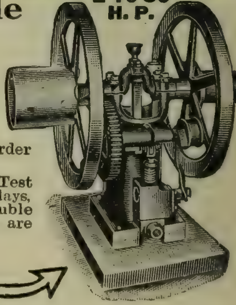
We Will Arrange Easy Terms To Suit You

Saves 50% in Fuel

Built on The ONLY Correct Principle World's Best Farm Engine

2 To 50 H. P.



Remember, the "UNITED STATES" is the only Engine which stands on its feet—*not* a Horizontal or Standard Vertical. Explosions occur low down and shock is transmitted directly into the earth—*not into the engine!* Result is: (1) Violent vibrations entirely overcome; (2) Bulk and weight greatly reduced; (3) Saving of 50% in fuel; (4) The only practical portable engine made; (5) all parts in sight, easily understood; (6) Lubrication by gravity, the only sure way—(7) Absolutely frost proof. In order to prove all these claims—and many more points of special merit—we earnestly invite you to

Test It Now At Our Risk 30 Days Free Your credit is good with us. Test this Engine thoroughly for 30 days, and, if satisfied, pay us part cash, balance on terms to suit. All sizes—2 to 50 H.P.—single and double cylinders. Burns Gasoline, Kerosene, Gas, Distillate. Thousands of users say that U. S. Engines are world beaters. Why should you think of buying any other engine?

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eeding whole grain s wasteful — especially so when prices for grain and stock are so high. Get everything out of your grain there is in it.

Fairbanks-Morse Feed Mills

grind mixed grain and corn on cob at the same time, insuring an easily digested mixture These mills have light draft, large capacity, long life. Grind fine, medium or coarse. No gears to waste power. Only mills that satisfactorily grind corn on cob with 2 horse power engine. Made with all wearing parts renewable at small cost.

Write us for Catalog No. CT449 describing Grinding Outfits, Shellers, Fodder Cutters, Oil and Gasoline Engines, Farm Scales, Water Systems, Electric Light Plants, Saw Frames, Spraying Outfits, Pumps, Windmills.

Fairbanks, Morse & Co.
900 S. Wabash Ave. Chicago, Ill.

vas applied to the tree, and the farmer, much pleased with the operation, went around predicting that he ould have the best fruit in town this year. Last week e had a party of friends out to dinner and at the table e handed each of them an apple from the tree. All

WATKINS' SPECIAL MOTORS

3 H. P. Single Cylinder	30 lbs.
6 H. P. Double Cylinder	60 lbs.
12 H. P. Four Cylinder	100 lbs.

A strictly HIGH GRADE Motor that will give CONSTANT and EFFICIENT service. Especially adapted for CANOES and LIGHT BOATS. Aluminum base, copper water jacket, steel shaft, bronze bearings.

THE WATKINS MOTOR CO.
837-839 West Sixth Street CINCINNATI, OHIO

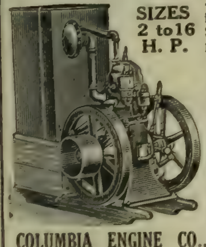
Use Kerosene Engine Free

The "Columbia" Kerosene Engine shipped on 15 days' FREE Trial, proves kerosene cheapest, safest, most powerful fuel. If satisfied, pay lowest price ever given on reliable farm engine; if not, pay nothing. No waste, no evaporation, no explosion from coal oil.

GASOLINE GOING UP!

Gasoline is 9c to 15c higher than coal oil. Still going up. Two pints of coal oil do work of three pints gasoline.

"COLUMBIA"



SIZES 2 to16 H. P.

— only engine running on coal oil successfully; uses alcohol, gasoline and benzine, too. Starts without cranking. Only three moving parts—no cams—no sprockets—no gears—no valves—the utmost in simplicity, power and strength. Mounted on skids. All sizes, 2 to 20 h.p., in stock ready to ship. Engine tested before crating. Comes all ready to run. Pumps, saws, threshes, churns, separates milk, grinds feed, shells corn, runs home electric lighting plant. Prices (stripped), $29.50 up. Sent any place on 15 days' Free Trial. Don't buy an engine until you investigate money-saving, power-saving "COLUMBIA." Thousands in use. Costs only postal to find out. If you are first in your neighborhood to write, you get special extra low introductory price. Write!

COLUMBIA ENGINE CO., 547 Bellevue Ave., DETROIT, MICH.

POWER

For YOU!

Power from within! Strength that is **more** than mere muscular strength — the strength of perfect health, abundant nerve force — now within your own reach through **Vibration**! Nine people out of every ten are only **half alive**! Are you? Listen—

All the Benefits of Life, Strength, Youth

may be returned to you through **Vibration. For Vibration is Life itself.** It will chase away the years like magic. Every nerve, every fibre in your whole body will fairly tingle with the force of your own **awakened power!** Stagnation simply cannot exist. You are made over new from head to foot. Your blood is sent humming along through every vein, artery and tiny capillary. All the poisonous matters in your system are **washed away.** Your self-confidence — **your self-respect** are increased a hundred fold.

Three Great Aids to Health

With the White Cross Electric Vibrator in your home you can get besides Vibration, Faradic and Galvanic Electricity. This machine may also be connected up with an ordinary rocker to make a perfect vibrating chair. No extra charge for this attachment. The White Cross Electric Vibrator may be connected with the electric current in your home, or will run perfectly on its own dry cells.

Special Offer for a Limited Time

For a short time only we are making a remarkable Special Introductory Offer on the White Cross Electric Vibrator—amazing discounts — actual rock-bottom prices direct **if you act at once.**

FREE BOOK

Sign the coupon and mail it to us today. Get our splendid big FREE book telling you all about the marvels of **Vibration.** Read what scientists say about it. Post yourself on what it will do for you. Learn all about the **White Cross Electric Vibrator** and our limited offer. You are under no obligations at all —all you need to do is to send the coupon **today** — you can send a postal card or a letter, but the coupon will do just as well.

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Without any obligations on my part, please send me, free and prepaid, your free book on Vibration, full particulars of the White Cross Vibrator and your Special 60-Day Offer

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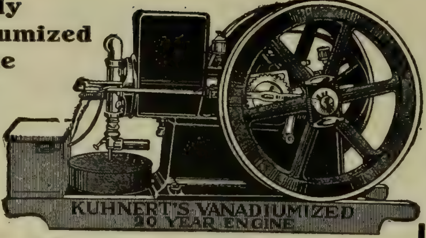
Write Plainly

The Only Vanadiumized Gasoline Engine



Use the Vanadiumized 20 Year Engine FREE

The only gasoline engine for general use with the marvelous strength of vanadium in it. Use it for 10 whole days free. Use it to prove that the new vanadiumized engine is the wonderful engine you have been wanting—practically lasts forever. Easiest to handle. Uses less gasoline. Write for description of this marvelous 20 year engine.

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Never mind the money. My payment terms are so very easy that you never think of the money. Marvelous quadruple durance **Kuhnert Vanadiumized 20 year engine** is paying for itself and giving you big dividends before you ever begin to pay us a single cent.

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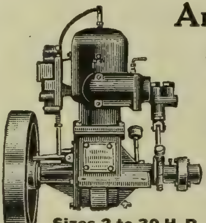
WHEN YOU WANT ANYTHING AND DON'T KNOW WHERE TO FIND IT—WRITE BUREAU OF INFORMATION, POPULAR MECHANICS, CHICAGO



An Improvement of Immense Value

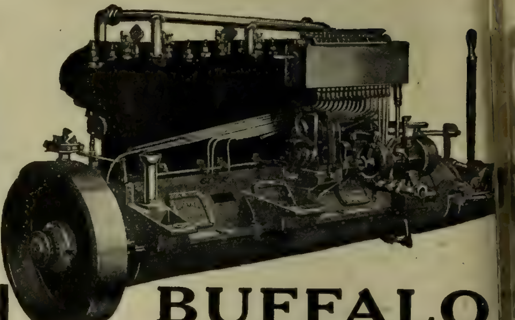
This Caille Perfection Marine Motor has a *Waterproof Ignition System*—No Batteries—No Magneto—No Timers—No Coils. Absolutely Trouble and Waterproof. The most dependable marine power plant in the world.

Perfection marine engines range from 2 to 30 hp., full rating guaranteed. They are adapted to all power-boat uses, including yachts, cruisers, tugs, fishing boats and launches.

Sizes 2 to 30 H. P.
Full Rating Guaranteed

Get our free 1913 engine catalog—it tells you how to run your motor boat and how to enjoy it. *Write today.*

CAILLE PERFECTION MOTOR CO.
1207 Caille Street DETROIT, MICH.



BUFFALO MARINE ENGINES

are all of the four stroke type, slow speed, medium speed, high speed—3 to 125 H. P.

They Excel in Reliability

The Buffalo Book tells the whole story. If you want it, send us your name and address.

The Engine of Constant Service.

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Seattle—Woodhouse Gasolene Engine Co., 62 Marion Street.
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Buffalo Gasolene Motor Co.
1293-1305 Niagara Street, Buffalo, N. Y.

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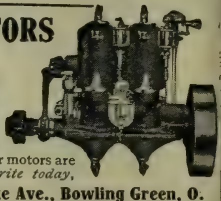
made efforts to penetrate the skin but in vain, an when the farmer tried he broke a tooth. The apples if one is to believe what he reads, were as hard a stone.—Engineering Contracting.



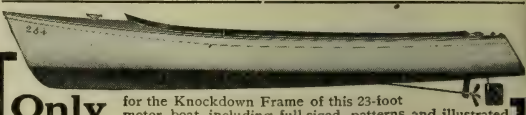
TOLEDO MARINE MOTORS

Complete and Guaranteed

3 H.P.	1 cyl.	$ 65.00
6 H.P.	1 "	84.00
6 H.P.	2 "	125.00
12 H.P.	2 "	160.00
18 H.P.	3 "	250.00

Don't buy any motor until you have read our Catalog C, telling you about "Toledo" quality and the equipment we provide. Our motors are 2 cycle, 2 port, 3½ x 3½ and 4½ x 4½. *Write today,*

THE UNIVERSAL MACHINE CO., Pike Ave., Bowling Green, O.



Only $25 for the Knockdown Frame of this 23-foot motor boat, including full-sized patterns and illustrated instructions to finish—speed 9½ to 14 miles an hour—12 passengers. Now's the time to start assembling your boat. **Write for Free Boat Book.**

BROOKS MANUFACTURING CO.
8012 Rust Ave. SAGINAW, MICH.

9½ to 14 Miles an Hour

On or Off in Five Minutes

Makes a Motor Boat of ANY Boat AND also "makes good" on shore

Here is the famous original Portable marine motor, now adapted for also running a hundred different small machines ashore. Simple—light—strong—SOLD ON THIRTY DAYS TRIAL.—Money back if you say.

"PORTO" the Marine and Stationary Engine Combined—TWO MOTORS IN ONE

A reliable 2 h. p. motor that will drive an 18 ft. rowboat 7 miles per hour for 4 hours on a gallon of gasoline, or in five minutes can be mounted for use in shop, laundry, barn, or any other place desired. **Write Quick** for new "Two-in-one" catalog, mailed free. Orders filled in order of receipt. Don't delay.

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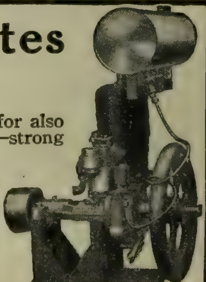

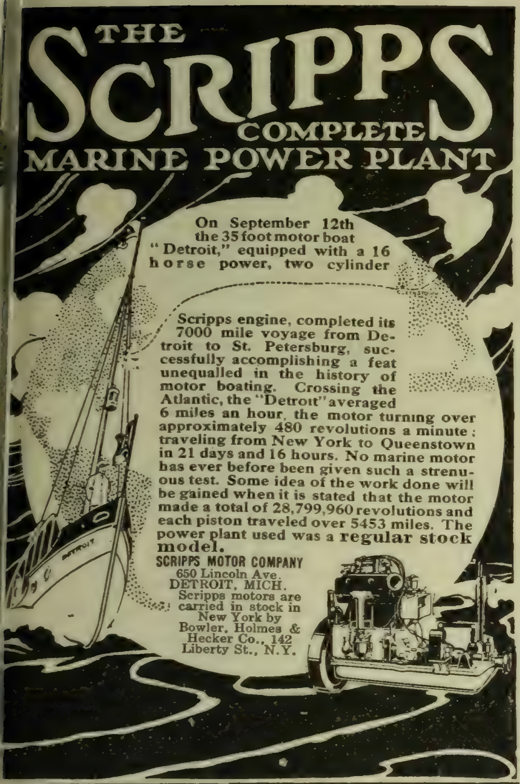
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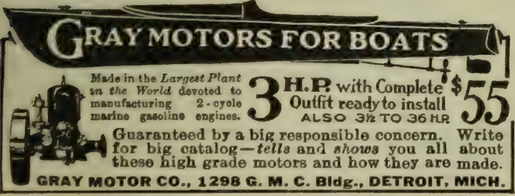
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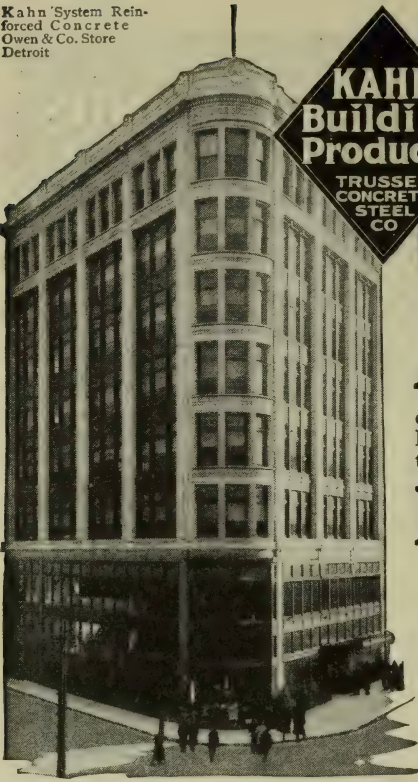

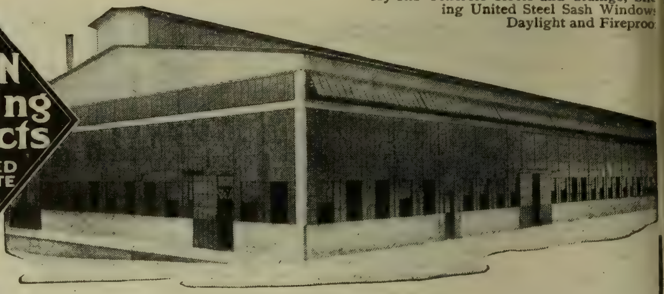

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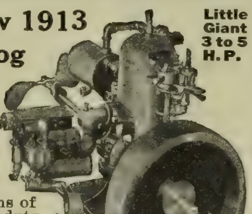

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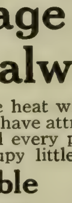

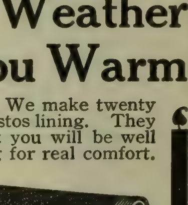

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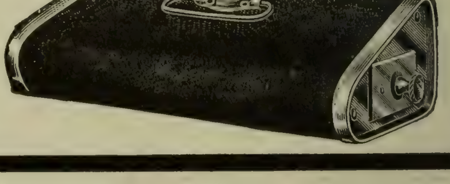

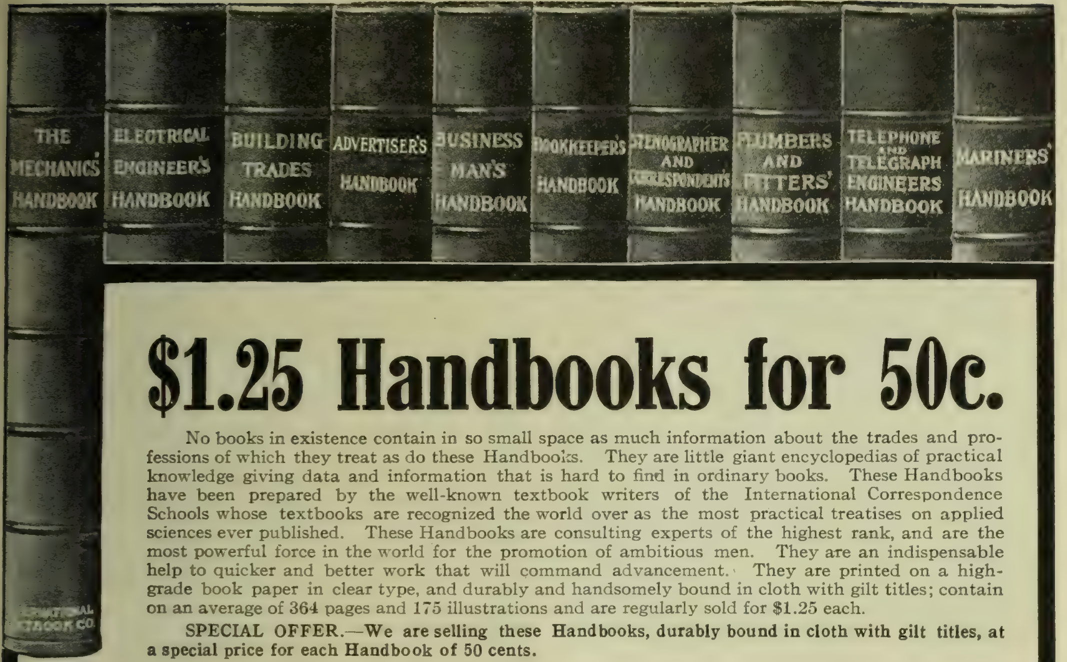
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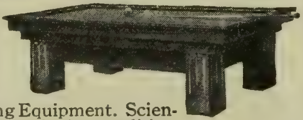

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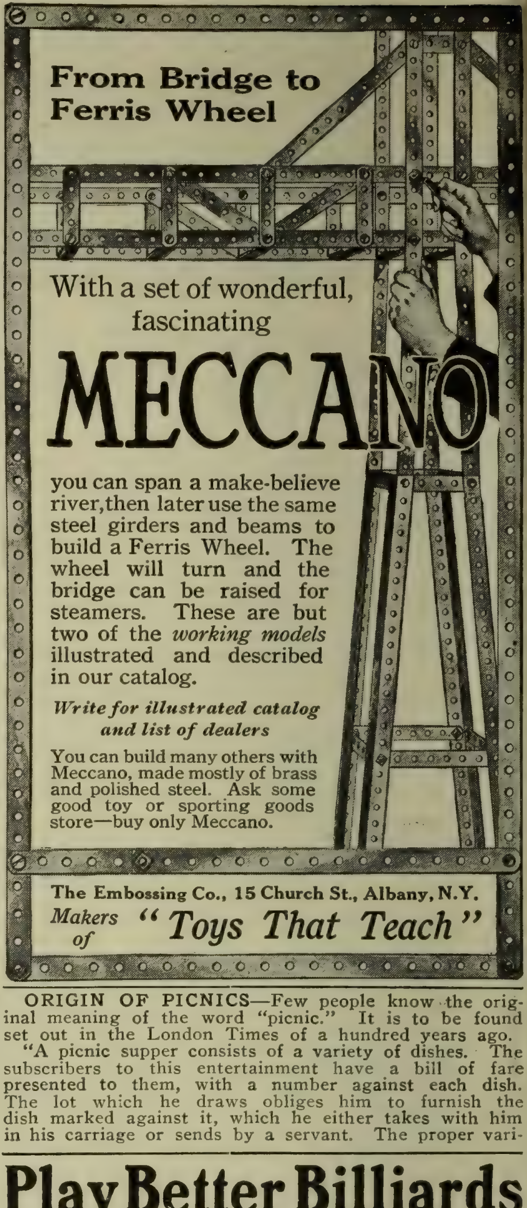

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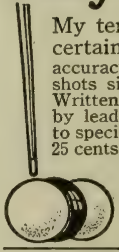

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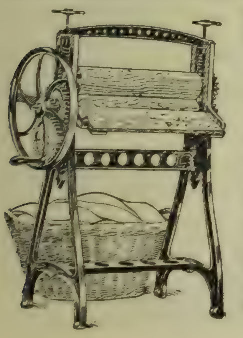

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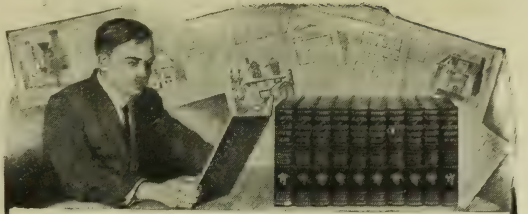

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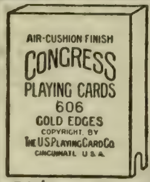

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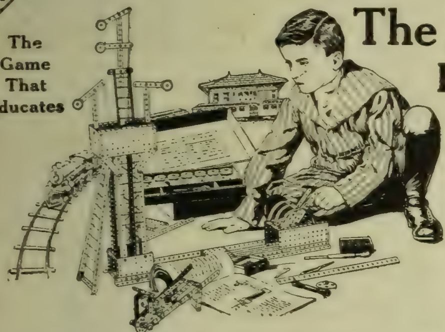

The Game That Educates

The American Model Builder
For Your Boy's Christmas Gift

Boys! Will You Get One?

Twenty thousand boys will be made happy this Christmas with a set of the American Model Builder. Will you be one? Think of the fun you can have and the practical knowledge you can get building models like those in the picture above and hundreds of others. This wonderful game is the most interesting mechanical toy ever invented.

Each outfit consists of different parts used in modern steel construction. Here are beams, girders, angle irons, braces, wheels and gears, with bolts and nuts to fasten them together. Complete Manual of Instruction with each outfit.

Ask your father to buy you an American Model Builder. With this wonderful toy you can spend many pleasant hours together. Ask him today and be sure he gets the "American Model Builder."

Buy your boy a Christmas present that will teach him something useful, besides giving him hours of wholesome fun. Here is just the thing—a mechanical toy that will fascinate and amuse and, at the same time, develop his knowledge of machinery and steel materials.

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extending up to be grasped by one of the operator's hands, while the other hand turns a drive pulley geared by a rope with a fan which sucks the dust up into a receptacle carried by the handle above the fan. A machine following this plan of more than 40 years ago, if well made mechanically, would present a good appearance alongside of the modern machines, and doubtless would give good results in actual use.

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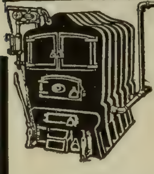

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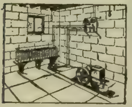

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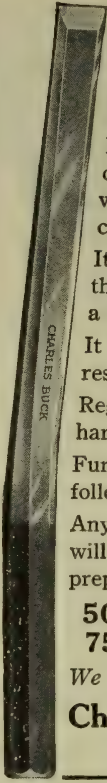

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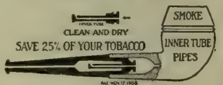

No saliva reaches the tobacco, nor can it be drawn back into the mouth. Smokes clean to the heel. Cleaned by swing of the hand. The best pipe ever produced. Absolutely guaranteed. Your money back if not satisfied. Pipe illustrated, curved or straight stem, sent postpaid, $1.00; best French briar, sterling silver ferrule; hard rubber bit; Inner Tube Pipes 50c to $2.00. Send for pipe and catalogue today. **Agents Wanted.**

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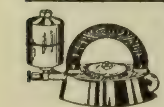

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THIS illustration shows the **roomy, graceful, sensible lines** of this **Garrison** and **Marching shoe designed** by **Army surgeons** to give Uncle Sam's men the **best feet in Christendom.** Observe the **half bellows tongue** and the way **comfort and good looks** have been **built in.**

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the injured blood-vessels, wander about for a while in the tissues, and die. When they die, the iron that made them red before, then changes to black-and-blue coloring. After a while, this iron is taken up by the glands, called the lymphatics, and made over again into nice red cells. The iron is taken up very much more quickly by the lymphatics if the black-and-blue spot is rubbed and massaged.—Lewiston Journal.

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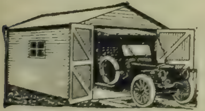

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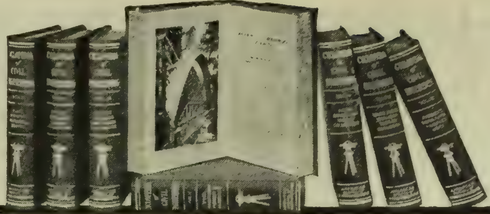

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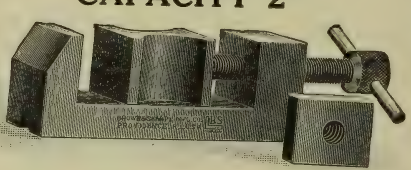
B. & S. Toolmakers Vise

CAPACITY 2"



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TOBACCO-BAN GUARANTEED EASY to Take. Relieves all craving for tobacco in 70 to 120 hours. Write today. **BANNER REMEDY CO., Dept. G, 33 W. 9th St., Kansas City, Mo.**

REO THE FIFTH Mr. Olds' finest creation—his FAREWELL CAR—with center Cane-Handle Control.

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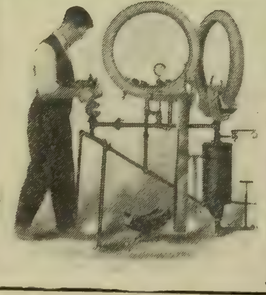

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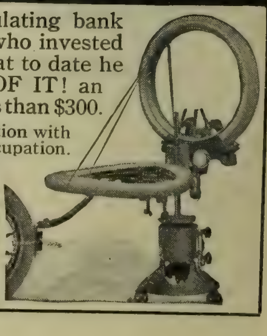
A tire repair plant may be operated as a side line, in connection with the automobile or any other business or as an independent occupation. We have outfits for all requirements, and furnish detailed information for operating each plant. Experience is unnecessary, for the work is simple and easily mastered. All you need to do is follow directions furnished with machine. It costs you nothing to investigate. Send for our latest catalog and look into the proposition.



HAYWOOD TIRE & EQUIPMENT CO.
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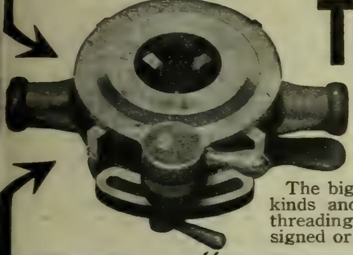
Pipe Threading Tools



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Plenty of models for any kind of service

The Motors That Never Backfire

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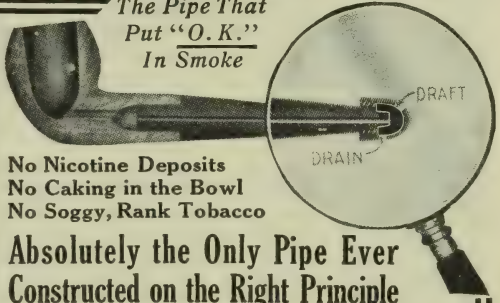
The Pipe That Put "O. K." In Smoke



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No Caking in the Bowl
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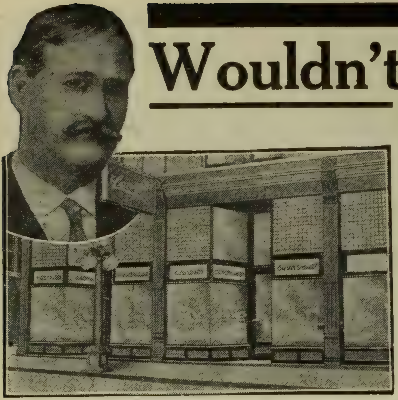

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Come to See Me at My Expense

Don't say you're coming. Just drop in quietly Call on any banker or merchant. Ask them about Long—about my store—my crispette business. Ask them if what I say isn't the truth—right from the shoulder. Look into my reputation. See if folks think I'll give you a square deal. Then come and see my store—see that it's just like the picture. See the machine. See crispettes made—make a batch yourself. Learn the business. Get my pointers on how to succeed. Up to a distance of 300 miles I'll pay all your traveling expenses, if you buy a machine. You'll see—know—learn everything. It's simple—easy. Won't take you a day. I'll be glad to see you—glad to show you the store and have a good talk with you. You'll go home ready to make more money than you ever made in your life.

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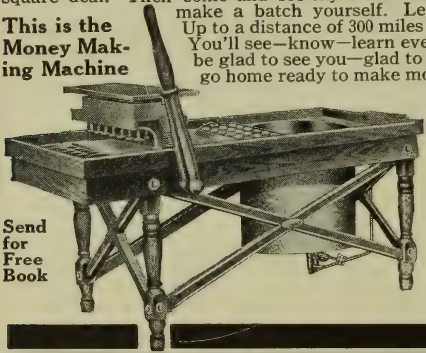

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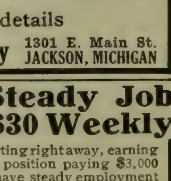

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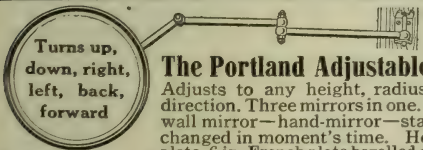

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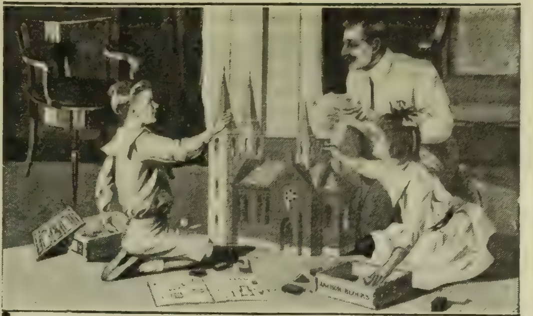

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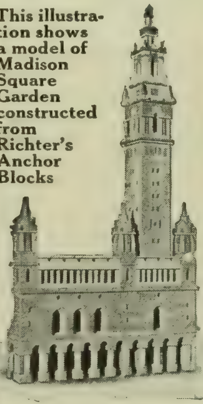

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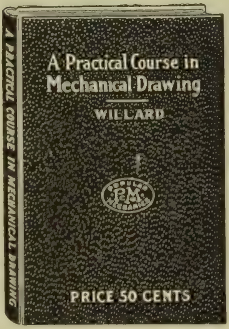
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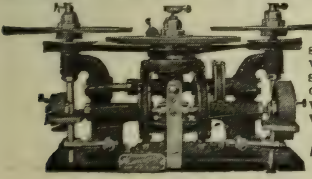

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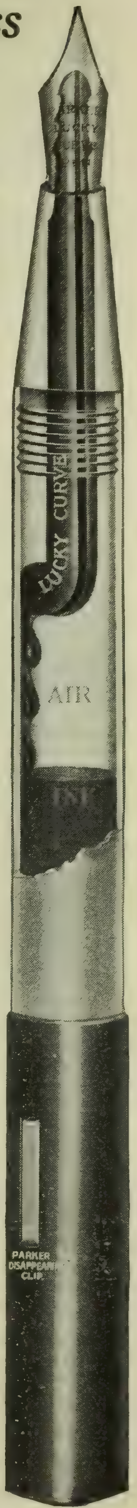

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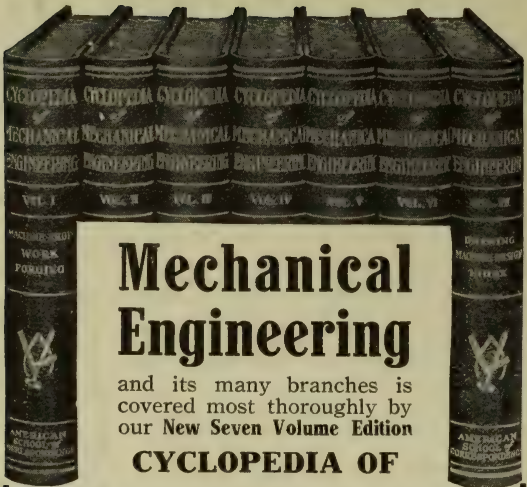

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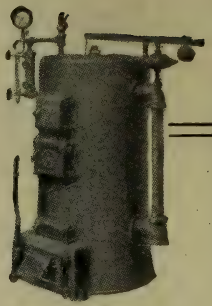

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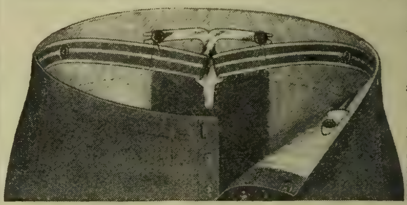

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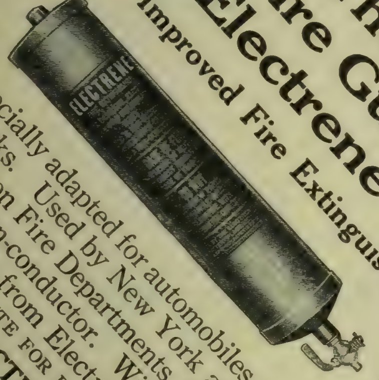

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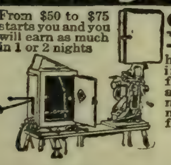

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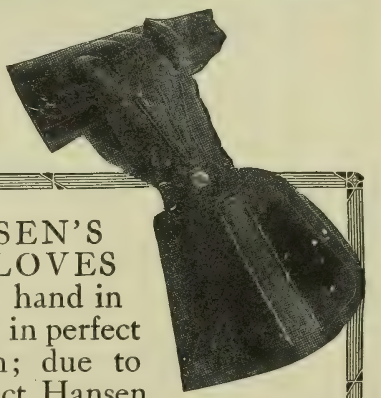

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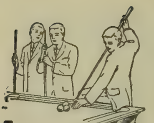

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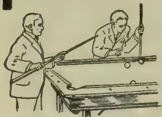

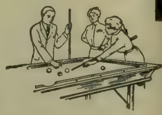

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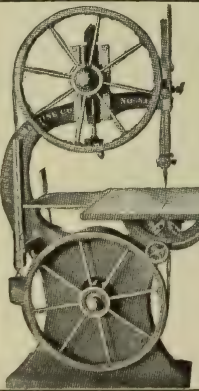

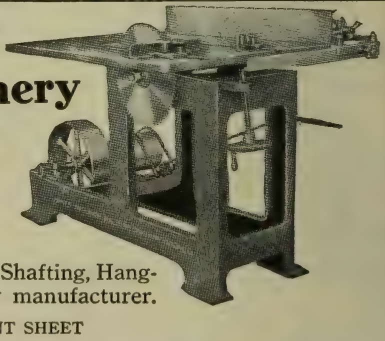

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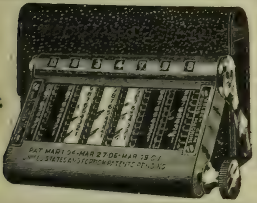
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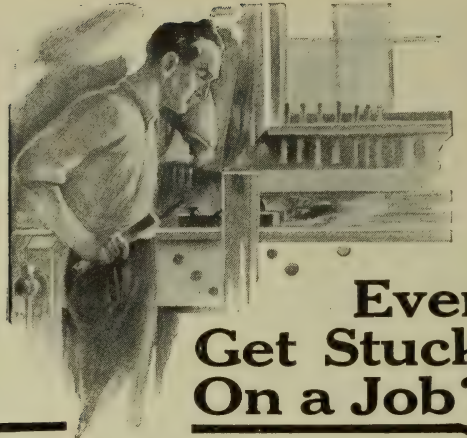

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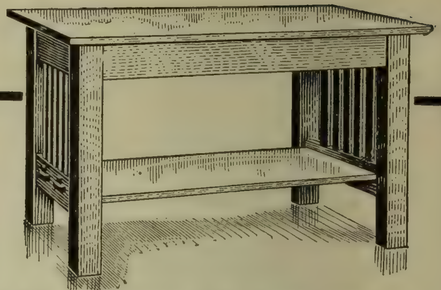

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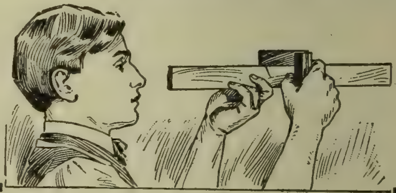

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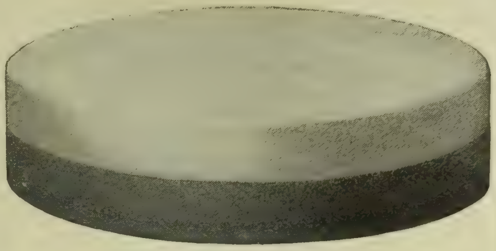

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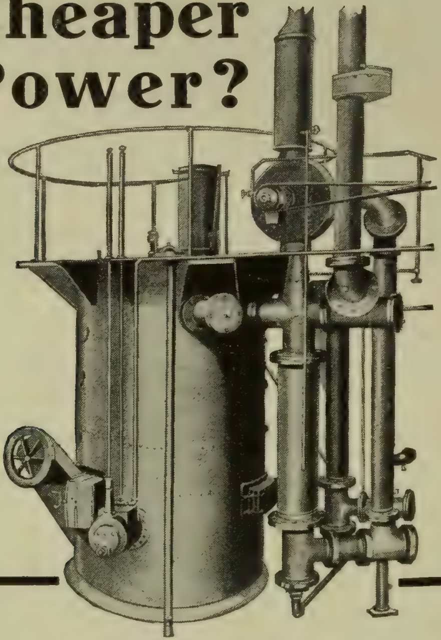

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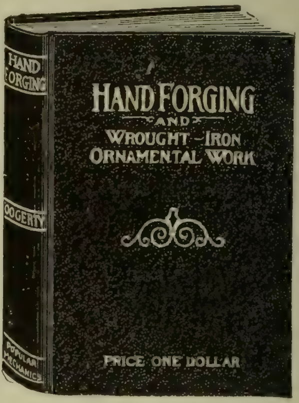

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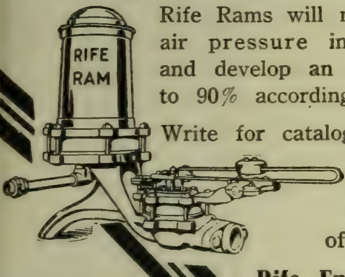

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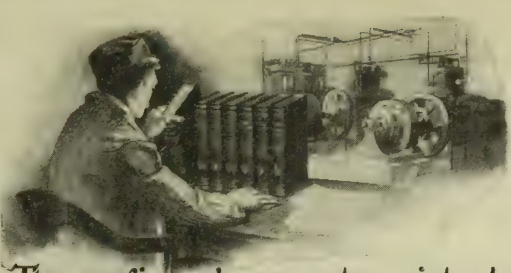

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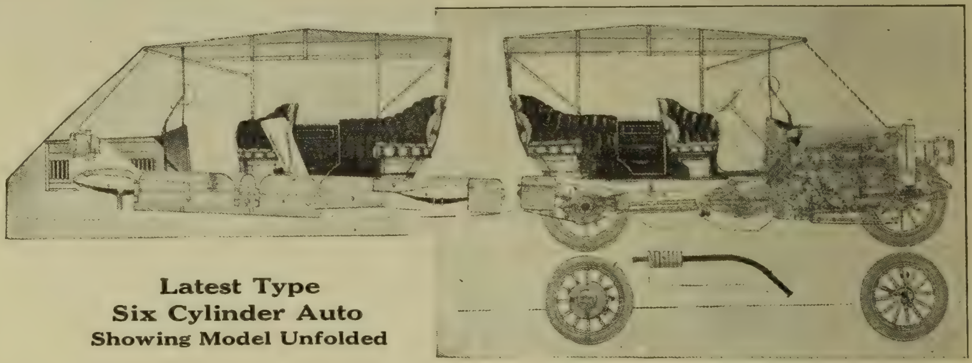

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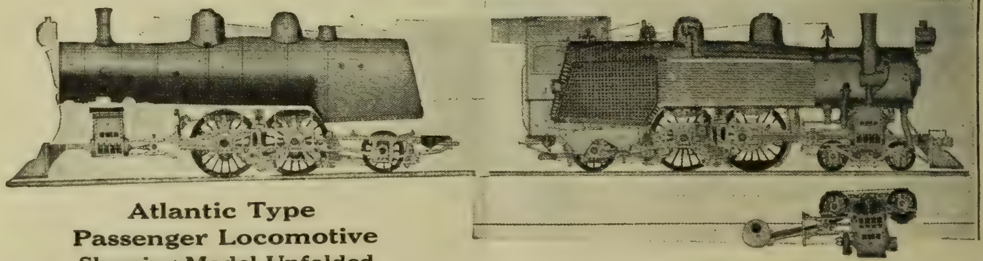

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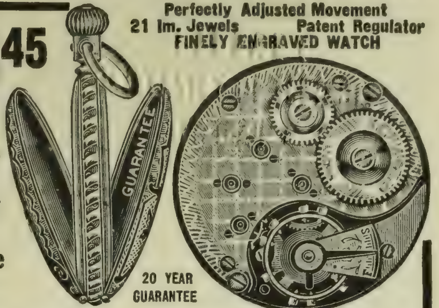

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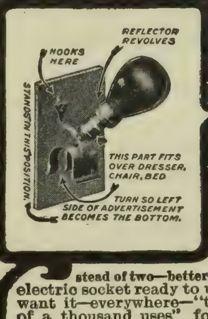
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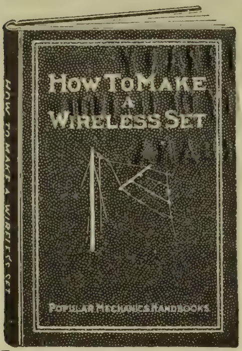
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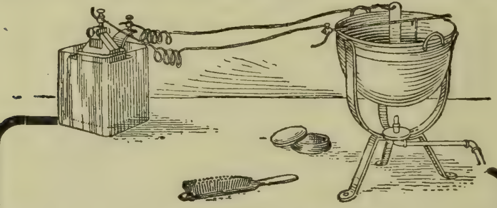

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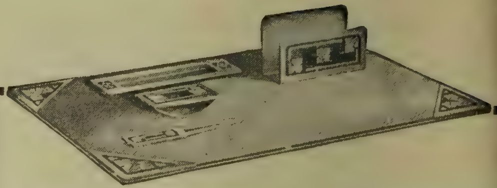

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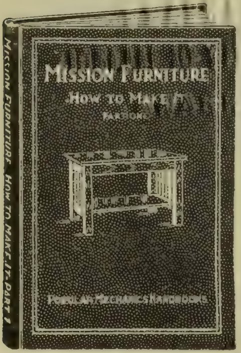
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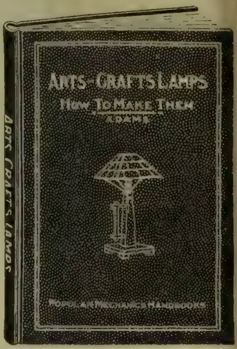

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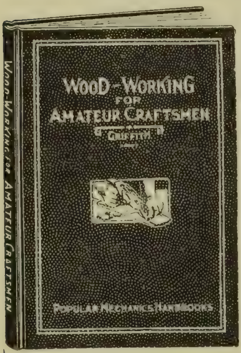
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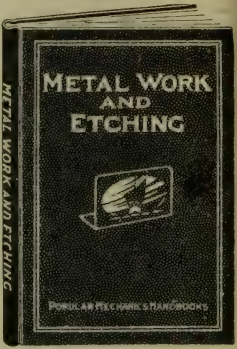

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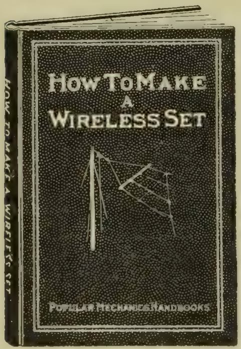

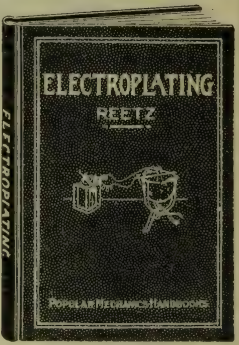

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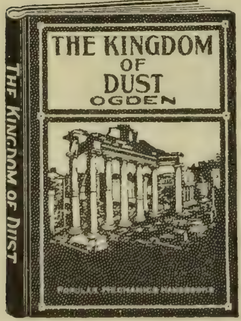

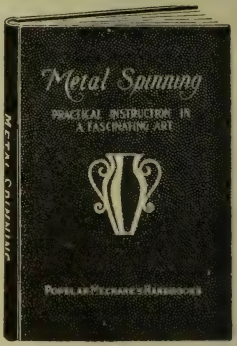
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There are too many Good People Trying to Live in the Cities on a slender margin of Resources who Ought to Be Elsewhere in this Broad Land where Fertile Acres stretch Unoccupied under Gentle Breezes, and where All of the Best of Earth's Products are to Be Found in Overflowing Abundance. A Pied Piper is Perpetually Pulling them from the Country to some Magical Metropolis, and There They Live and Swelter in City Tenements and Flats — Dreaming of the Days when "Three Square Meals" was a Habit and not a Hallucination. The City's Lure has Led Them from the Country Fields that Fed Them. I didn't Intend to Break into Poetry, but *I Do Want You to Break Away from Poverty.*

My Advice to You, therefore, is — **Get a Home in Gulf Coast Texas.** I would further say—**Get a Home in Our Danbury Colony —in the Rain Belt,** where you can Grow Three Big Money-making Crops a Year, and Where **Irrigation** and **Fertilization** do not eat up the Profits Your **Hands Create.**

We are Extending to our Colonists the kind of **Co-operation** that **Co-operates** — building Bridges, making Roads, and Ditches, etc., and have Expended nearly Fifty Thousand Dollars the past Summer in such Improvements. More than Ten Thousand Acres have been Sold during the past ten Months to Satisfied Purchasers, because we have a proposition that can Stand Unashamed beneath the Spot Light of Publicity, and Where Your Days of Prosperity Shall Be Long Upon the **Land.** We are selling Real Land and not Sand—**Get That**—a Rich, Loamy, Black Soil, that **You Couldn't Wear Out in a Hundred Years.**

I believe you could save Twenty-five Cents a Day if You tried. I know you would Try if you Realized that our Growers of Figs, Strawberries and Early Vegetables clear a net profit of $300 to $500 an Acre. Men have Realized more than $1,000 an Acre growing Oranges in our Country. Remember that our Early Vegetables get to Northern Markets in Mid-Winter and Early Spring, when they command Top Prices.

One German Truck Grower on adjoining lands this Spring realized nearly $500 from three-fourths of an acre of Strawberries. You could do as well if you only Tried, and on a Ten-Acre Tract **Find Financial Freedom.**

The Biggest Price paid for a car of watermelons on the Houston Market this year was $140. The car was shipped by the Danbury Fruit and Truck Growers' Association.

We are situated within convenient shipping distance of Three Good Railroads, and in addition to this have the inestimable Advantages of Water Transportation through the Splendid Harbors of Galveston and Velasco, so that our Freight Rates are Cut Practically in Half. The Climate is Extremely Healthful and Superior to that of California or Florida —Winter or Summer — owing to the Constant Gulf Breeze.

Our Contract Embodies Life and Accident Insurance, and should You Die, or become totally disabled, Your Family, or anyone else You name, will get the Farm without the payment of Another Penny. If You should be Dissatisfied, we will Absolutely Refund your Money, as per the Terms of Our Guarantee.

Write for our Free Book, which contains nearly 100 Photographs of Growing Crops, etc. Fill out the Blank Space below with your Name and Address, plainly written and mail it to the Texas-Gulf Realty Company, 1306 Peoples Gas Building, Chicago, Illinois. Read it Carefully, then use your Own Good Judgment.

* * *

Please send me your book, "Independence With Ten Acres."

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I DON'T SELL YOU printed school lessons or pictures to copy. You MUST learn on actual Drafting room work to get the required experience.

I DON'T SELL YOU or give you a worthless "cheap-skin" Diploma to hang on the wall and that will be all.

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AND I TRAIN YOU personally and individually to advance you as fast and far as you can go.

AND I TRAIN YOU on practical work to give you required UP-TO-DATE, PRACTICAL WORKING EXPERIENCE.

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I AM NOT teaching 227 different trades — ONLY ONE and THAT ONE right.

I AM NOT looking for students—they look for me, for I have been at this over 22 years.

I AM NOT accepting every one that has the price—only those anxious to succeed with me.

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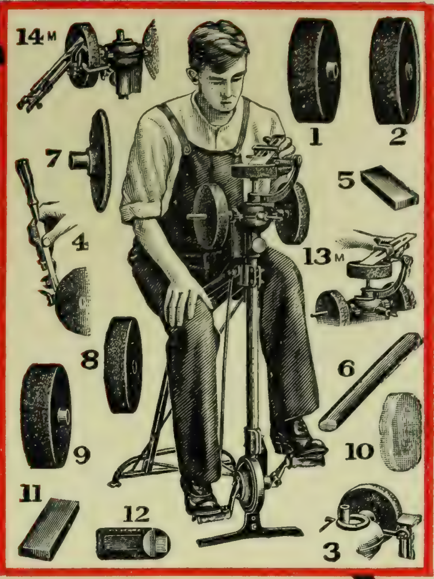

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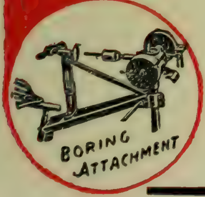

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